

Annual Report
of the
Department of Agriculture

FOR THE YEAR ENDED 31ST DECEMBER, 1955



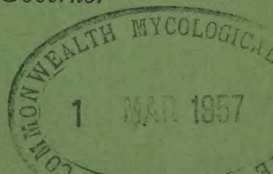
UGANDA PROTECTORATE

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UGANDA PROTECTORATE

DEPARTMENT OF AGRICULTURE

Annual Report

For the year ended 31st December, 1955

I. General Review

By J. G. M. KING, O.B.E., *Director of Agriculture*

FOREWORD

An annual report, like a sermon, is only a good one if the writer has something to say and it is confidently believed that the Department of Agriculture has some progress to record in 1955. Despite a drop in the prices of the Protectorate's primary products, and further decreases in the world prices of cotton are anticipated, the pattern of African agriculture which has evolved over the course of many years and which was described in the Report of the Agricultural Productivity Committee in 1954 takes on a clearer shape.

2. In the post-war period Uganda has indeed enjoyed great good fortune because the prices of both her cotton and her coffee have been maintained at record levels for a number of years. The inevitable fall in market prices which hit the world's agricultural commodities was delayed in respect of cotton and coffee and the Uganda producer of these crops enjoyed his highest price for cotton in the 1954/55 season and for coffee in 1954. The days of record prices are, however, unlikely to return in the near future. Whilst the trend of the cotton market is uncertain current prices for coffee still made this crop highly remunerative and particularly so to the African producer.

3. In the belief that the reading public prefers a short annual report which contains all the basic facts, the form of this report differs slightly from the reports published in the preceding two years. The main report, which is brief and which is more in the nature of a review, covers the principal agricultural developments during the year and the Department's plans for the immediate future. It is followed by a number of appendices which contain basic statistics relating to rainfall, agricultural production, population and availability of land. Information in greater detail is given after the appendices, in individual reports from the four provinces, together with the reports by the officers responsible for the

Special Development Section of the Department and the Serere Experiment Station; short précis describing the main activities of the Botany, Chemistry and Entomology Sections of the Laboratories Division, prepared by the officers responsible for these sections, are also included. More detailed reports on the research work undertaken by the Department will be published at a later date.

WEATHER

4. Most areas experienced rainfall which was either up to or above the average, but distribution was erratic, and in many places differed widely from the normal pattern.

5. There was more rain than normal everywhere during the first two months of the year. The main rains were a little late in breaking and were unusually short except in the Western Province. The mid-season dry weather was exceptionally severe, particularly in the Eastern and Buganda Provinces. The second rains in the Northern and Western Provinces were of long duration and were very heavy. Unseasonal rain occurred throughout the country towards the end of the year. In the Eastern and Buganda Provinces there were fairly good rains in August and September, but thereafter, until December, there was a long and severe dry interval at the time the second rains could normally be expected to reach their peak.

6. The earlier planted first rains crops gave satisfactory yields, but because of the lack of rain in June the later plantings and particularly the grain crops in the Northern Province yielded light harvests. The good rains in August and September encouraged large-scale plantings which yielded well. The weather during the year was particularly favourable for perennial crops but because of the dry spell in the middle of the year the cotton crop was planted too late. Subsequently, the weather during the growing period was satisfactory on the whole, despite a dry period in October and November in some areas.

CROP PRODUCTION

FOOD CROPS

7. Food production was adequate throughout the year despite the unusual rainfall pattern. The weather was favourable for perennial crops, and in those areas where plantains are the staple food supplies were plentiful. The short duration of the first rains generally resulted in a reduction in the acreages of food crops planted in that period and in the Eastern and Northern Provinces yields from grain crops were below average. Planting in the second rains was strenuously encouraged with successful results so that the total acreages for the year were little below

the average; furthermore, these second rains plantings, particularly the root crops, gave good yields.

COTTON

8. The cotton acreage of 1,738,821 planted during the 1954/55 season was the second largest in the history of the country, but unfavourable weather during the growing period and the heavy rains during harvesting, combined with a high incidence of pests and of blackarm disease in areas where the seed was not treated, gave rise to low yields and the total crop was only 299,935 bales which was almost 100,000 less than in the previous season. The following table gives comparative figures of production over the past eleven seasons.

TABLE A
COTTON PRODUCTION
1945-55

Season	Estimated acreage	Bales of lint (400 lb.)	Average yield of seed cotton per acre	Average price to growers (100 lb.)
				<i>Shs. cts.</i>
1944-45 ..	1,072,493	272,567	337	14 83
1945-46 ..	1,145,568	227,554	265	16 40
1946-47 ..	1,253,257	231,745	247	18 45
1947-48 ..	1,036,829	170,066	218	20 42
1948-49 ..	1,555,371	391,240	333	29 61
1949-50 ..	1,628,473	339,788	282	31 75
1950-51 ..	1,535,200	346,465	301	43 16
1951-52 ..	1,514,157	380,304	332	47 56
1952-53 ..	1,472,553	319,992	290	48 60
1953-54 ..	1,611,223	397,631	325	49 40
1954-55 ..	1,738,821	299,935	227	58 81

9. The prices paid to the growers were Shs. 10 per 100 lb. higher than in the previous season, being Shs. 61 per 100 lb. for first quality cotton of the variety B.P.52 and Shs. 60 per 100 lb. for the variety S47. These prices, the highest which growers have ever received, brought the growers' total receipts for the crop up to £11,584,116 as compared with £12,925,896 last year, despite the drop in production. Nevertheless, 1955 was the first year in which the gross receipts to growers from the coffee crop exceeded those from the cotton crop. The whole of the cotton crop was sold by the Lint Marketing Board through free market sales in Kampala. Because of the dry weather, particularly in June, the total acreage planted in 1955 at 1,585,500 was approximately 150,000 acres below that of 1954-55 and on average it was planted considerably later. Weather during the growing period was more favourable and the incidence of pests and diseases was below normal; yields, therefore, showed an increase over those obtained in the previous season and a bigger total crop is expected.

10. Approximately 110,000 tons of cotton seed were produced from the 1954-55 crop. After planting requirements had been met, all the remaining 87,651 tons of seed were sold by the Lint Marketing Board to local oil millers at the high average price of Shs. 516 per ton.

COFFEE

11. 1955 was a record year for the production of all types of coffee in the country. A total of 60,160 tons of clean coffee, other than that produced in Bugisu, but including a small quantity of arabica grown elsewhere, was inspected for export during the year. This was approximately 26,000 tons greater than the previous record production in 1951. The price to the growers remained at Shs. 1/25 per lb. of dried cherry from the beginning of the year until the middle of May when, because of the fall in world market prices, the price was reduced to 75 cents per lb. A large proportion of the total production, however, was sold at the higher price and coffee growers received a record total of £13,922,022 for the crop. Details of the total amounts of African produced clean coffee inspected for export during the last ten years are as follows:—

TABLE B
AFRICAN COFFEE PRODUCTION

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Cured coffee (tons) ..	24,449	17,238	31,142	18,351	26,263	34,362	29,563	26,998	25,196	60,160

12. The total 1954-55 Bugisu arabica crop was 6,170 tons of parchment coffee, which was almost double the 1953-54 crop and more than 2,000 tons greater than the previous record production. The cash return to growers was £2,015,662. Details of the last twelve seasons' crops are shown in the following table:—

TABLE C
BUGISU ARABICA COFFEE

Season	Parchment	Estimated value to growers
	<i>Tons</i>	<i>£</i>
1943-44 ..	3,679	105,592
1944-45 ..	2,705	73,740
1945-46 ..	2,817	97,169
1946-47 ..	3,058	107,215
1947-48 ..	2,996	121,692
1948-49 ..	2,857	173,799
1949-50 ..	2,852	184,859
1950-51 ..	2,896	442,104
1951-52 ..	2,203	377,575
1952-53 ..	2,307	633,040
1953-54 ..	3,122	1,231,791
1954-55 ..	6,170	2,015,662

TOBACCO

13. The acreages of all three types of tobacco showed an increase over those of the previous year and yields also improved. The details of production of the three types of tobacco for 1955, compared with the figures for the previous year, are as follows:—

TABLE D
TOBACCO PRODUCTION: FLUE-CURED

Area	1954	1955	Green Leaf		Cured Leaf	
			1954	1955	1954	1955
	<i>acres</i>	<i>acres</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
West Nile ..	1,503	1,657	1,479	1,889	—	5
Acholi ..	750	1,002	610	950	—	8
Lango ..	84	19	79	—	—	3
Kigezi ..	157	204	58*	146†	—	—
TOTAL ..	2,494	2,879	2,226	2,985	—	16

AIR-CURED

Area	1954	1955	Cured Leaf	
			1954	1955
	<i>acres</i>	<i>acres</i>	<i>tons</i>	<i>tons</i>
West Nile ..	1,285	1,198	153	266
Kigezi ..	190	540	12	24
Mubende ..	330	310	57	81
TOTAL ..	1,805	2,048	222	371

FIRE-CURED

Area	1954	1955	Cured Leaf	
			1954	1955
	<i>acres</i>	<i>acres</i>	<i>tons</i>	<i>tons</i>
Bunyoro ..	3,519	3,497	743	862
Mubende ..	697	979	133	205
TOTAL ..	4,216	4,476	876	1,067

* 1954 Spring Crop.

† 1954 Autumn and 1955 Spring Crop.

14. The sales of flue-cured leaf in Acholi District are the produce of a progressive farmer who has established his own curing barns, and in West Nile and Lango Districts of Co-operative Growers' groups which have been formed in order to cure their own leaf.

15. Prices for both air and fire-cured leaf were increased to Sh. 1 per lb. for first grade leaf and 70 cents for second grade. Prices of green leaf for flue-curing remained unchanged at 10, 8 and 3 cents per lb. for Grades I, II and III respectively.

GROUNDNUTS

16. There was an increase of approximately 60,000 in the ground-nut acreage in the Eastern Province, most of which was in Busoga District. The marketed surplus in the province is estimated at 12,750 tons of shelled nuts which is a large increase on last year's figure of 7,200 tons.

MAIZE

17. Once again the total maize acreage in the country decreased, probably due to the low prices received during the previous year. There was an increase in the acreage planted in Busoga District but yields were poor. The estimated sales were 280,000 bags of 200 lb. net in Buganda and 100,000 bags in Busoga, and no particular difficulties were experienced in meeting local demand for maize meal.

FLAX

18. Despite the introduction of the new "Hollandia" variety of flax seed, results of the 1954-55 crop were disappointing and the new variety did not show any conspicuous advantage over the former "Stormont Gossamer". The acreage planted was 492 and 323 tons of straw and 53 tons of seed were bought. Nor did the new variety bring any improvement in cash return to the growers, which compares unfavourably with that from other crops, and it was decided that the industry should be closed down once the current crop had been processed and sold.

NON-AFRICAN PRODUCTION

19. All coffee crops did well and estate production was no exception. 7,730 tons of clean robusta and 784 tons of clean arabica coffee were marketed during the season by the Coffee Industry Board on behalf of the estate producers, but prices received for the coffee were below those received in 1954. Non-African production of robusta coffee during the past eight seasons has been as follows:—

TABLE E
NON-AFRICAN COFFEE PRODUCTION (ROBUSTA)
(*Clean Coffee*)

Season	Production	Gross Value
	<i>tons</i>	<i>£</i>
1947-48	3,592	281,678
1948-49	2,581	227,247
1949-50	3,060	616,363
1950-51	3,846	940,504
1951-52	4,851	1,425,669
1952-53	5,921	1,846,697
1953-54	5,277	2,100,993
1954-55	7,730	1,944,790

The industry has shown a two-fold increase in quantity and nearly a seven-fold increase in value in eight years.

TEA

20. Three additional tea planting licences, for a total of 1,100 acres, were issued during the year, bringing the total licensed acreage at the end of 1955 up to 25,689. Additional plantings during the year amounted to 781 acres, giving a total acreage under tea at the end of the year of 10,059 acres. Total production of manufactured tea in 1955 was 6,959,742 lb. valued at £1,304,952. This represented an increase of more than half a million pounds over that produced in 1954.

SUGAR

21. A total of 16,877 acres of mature cane was harvested during the year on the two sugar estates and, due mainly to the favourable weather, the total production of 65,131 tons of white refined sugar was 25,000 tons more than in 1954. This large increase not only made importation of sugar into the country unnecessary but also permitted the resumption of exports to the neighbouring East African Territories.

SISAL

22. The only sisal estate in the country changed hands during the year with a consequent dislocation of production, and only 669 tons of fibre of all grades were produced during the year compared with 1,200 tons in 1954.

AGRICULTURAL WEALTH

23. Although the African farmer in Uganda sells a number of crops in addition to cotton and coffee it is from these two major crops that the bulk of his wealth is derived. The increase in that wealth during recent years is seen in Table F below, but is tangibly illustrated by the vast increase in the number of private cars on the roads in Uganda and the number of houses built in permanent materials. A flight over the coffee growing areas of Buganda reveals that thatched living huts are rapidly disappearing and roofs in permanent building materials are now the rule rather than the exception.

TABLE F
ESTIMATED VALUE OF COTTON AND COFFEE CROPS TO GROWERS

Year	Cotton	COFFEE	
		Robusta	Arabica
	£	£	£
1949 ..	7,375,806	861,666	187,772
1950 ..	7,333,800	1,820,373	214,711
1951 ..	10,371,871	3,119,626	492,178
1952 ..	11,929,069	3,925,085	405,812
1953 ..	10,373,899	5,054,771	676,434
1954 ..	12,925,896	6,886,264	1,403,995
1955 ..	11,584,116	13,922,022	2,147,664

24. The producers of cotton and coffee contributed to the revenue of the Protectorate by indirect taxation in the form of export taxes on these crops. Nevertheless, the three-fold increase in the money received from the sale of producers' crops since 1949 indicates that many cultivators have the means to improve their standard of living. This they are doing and the demand in Uganda for the necessities of civilisation is increasing. Unfortunately the distribution of this agricultural wealth is imperfect and it is naturally the more fertile areas, blessed with a reliable and adequate rainfall, which enjoy the major share. All districts, however, can show examples of very satisfactory cash returns from individual holdings where the owner has displayed judgment, hard work and agricultural sense in developing his land. It is gratifying to discover, as Agricultural Officers frequently do, that many of these progressive farmers have at some time attended a cultivators' course organised at the Department's training centres. Such farmers can serve as nuclei for further development through example and through local farmers' associations. The provision of better training facilities at the new farm institutes and proposals for the establishment of a farm planning service, which are dealt with elsewhere in this report, will do much to increase the number of these progressive farmers and the agricultural wealth of the country.

25. Although cotton and coffee have served Uganda excellently in the past, it is unwise to place too much reliance on two crops alone. Whilst cotton and coffee will undoubtedly continue to occupy first place in the economy of the country, the Department is aware of the necessity for diversification, and the possibility of growing other economic crops is constantly under review.

AGRICULTURAL DEVELOPMENT AND EXTENSION

26. Before recording the progress which is being made in the agricultural development of the Protectorate, it is desirable to set out the aims and objects of the Department of Agriculture. These aims were fully covered in the report of the Agricultural Productivity Committee and may be summarised as follows:—

(a) To ensure that the soil is conserved, and its level of fertility maintained or increased;

(b) to ensure that the cultivators of the Protectorate produce adequate food, both for themselves and for the consuming public, of a type and quality to meet their dietetic needs;

(c) to carry out by means of research and field experimentation, investigations designed to improve (i) the yields and quality of both crops and livestock, and (ii) the use of land and pasture;

(d) to introduce improved farming systems, which, where possible, combine crop and animal industry to their mutual advantage;

(e) to encourage and increase the production of suitable economic crops either for export or local use; and

(f) to ensure that the marketing of such crops as cotton, coffee and tobacco, up to the primary marketing level, is carried out as efficiently as possible and in accordance with relevant legislation.

Most of these aims and objects can be more simply described as "better farming".

LAND USE

27. Any schemes for better land utilisation in Africa must be preceded by campaigns for the protection of the soil against erosion. These drives must be directed at the entire population of cultivators, for soil erosion means loss of natural wealth and until soil movement is checked better farming methods cannot be adopted. Soil conservation campaigns have been in force in most districts of Uganda for some years; and a large proportion of the field staff of the Department has spent much time on such activities. The good results which have been achieved, notably in Buganda Province, in Kigezi District of the Western Province and in Teso District of the Eastern Province, have been brought about by intensive propaganda, the co-operation of county and sub-county chiefs, backed by Local Government bye-laws, the excellent work of the field staff of the Department and annual soil conservation competitions. The time has not yet come when pressure in this direction can be relaxed but in certain areas, where progress is greatest, it has been possible to give more attention to the second and less tedious stage of introducing other better farming methods by concentrating on potentially good farmers. An increase in the field staff has helped and, in Buganda particularly, each year sees a larger number of farmers applying organic matter to the land in the form of kraal manure or coffee husks and using waste vegetable matter as mulch. Nevertheless, in spite of some excellent progress it would be wishful thinking to suppose that more than the fringe of potential productivity has been touched. Even in the heavily populated parts of Buganda, which at a casual glance appear to be fully cultivated, there is much scope for more intensive and greater production without danger to the fertility of the soil. There is also some evidence that the acreage under plantains is excessive, particularly if the yield of all gardens were to be brought up to a higher level. By better farming,

therefore, more land would become available for the increasing population, for alternative food crops to improve the diet and for growing economic crops for cash.

28. Throughout the agricultural areas of the Protectorate there is a scattering of good small farms which have been developed by the acumen of individual farmers. Some of these farmers may have specialised in coffee, fruit, vegetables or tobacco, from which they derive their main cash needs, in addition to feeding themselves from their holdings; in other cases they may have diversified their farming in such a way that the cash return per unit area is considerably greater than that of their neighbours; in still other cases the farmer may have followed the usual cropping of the area, say finger millet, sweet potatoes, cotton and cow peas, but by greater attention to better husbandry methods he invariably obtains higher yields than those of his friends. Such farmers are still the exception and, whilst they set a good example to others, which may be followed, the fact remains that a large mass of cultivators need some stimulus to greater efforts and therefore to greater financial gain. It is believed that, given a receptive community, the inertia of Africa might be overcome by the individual approach but on a mass basis. This, however, will not be achieved without first obtaining the confidence and understanding of the farmers. With this in view, consideration has been given to the formation of a farm planning service and the initial steps for setting-up such an organisation have been taken. Much useful experience can be gained from our neighbour Kenya where such work is several years ahead. Farm planning entails much detailed work and, whilst some district staff could be released for this purpose, additional staff will be necessary if present plans are accepted.

29. The Agricultural Productivity Committee recommended that, in addition to organised settlement of the surplus population from Kigezi District attention should also be paid to the intensification of agriculture within that district. The field staff working in Kigezi has accordingly been greatly strengthened and it is intended that this staff, once the way has been paved by initial discussion with the responsible local authorities, will devote much of its time to farm planning and to the introduction of better farming systems.

30. In the Eastern Province also, particularly in Teso, Bukedi and Bugisu Districts, there is an urgent need for introducing better organised farming systems to ensure more efficient use of the land. Pressure on the land in the Kumi area of Teso is already being relieved slightly by a settlement scheme within that district, but the planning of the residual farms in the Kumi area and elsewhere is even more important. Likewise, in the Bukedi area, figures of available land reveal that the portion which is resting under grass is dangerously low and better systems of farming practice are essential if a reasonable living standard for the people is to be maintained. In some areas of the Protectorate land fragmentation is

a problem and consolidation of holdings must be the first step before farm planning is possible.

31. In the semi-arid areas the problem is different. In Karamoja the first need is the rehabilitation of the over-grazed land, the reduction of thornscrub and the provision of water supplies. On the recommendation of the Agricultural Productivity Committee a Natural Resources Team has been built up during the course of the year and at the end of 1955 three of the four new Field Officers had been recruited and had been posted to the district. The fourth officer was due to arrive early in 1956, and each will be responsible for his own particular part of the district, under the guidance of the District Officer (Natural Resources), who has the advice of the local technical officers.

AGRICULTURAL EDUCATION

32. The Agricultural Productivity Committee in its report stressed the need for larger numbers of better trained African staff, and the fulfilment of many of its other recommendations will depend on the provision of these men. In 1955 plans for the two main farm institutes were pressed ahead strenuously. A committee was set up to make recommendations on the staff required, the type of syllabus and the general organisation of these institutes. Its recommendations, with some minor amendments, have been accepted by the Natural Resources Education Sub-Committee. At the end of the year the building plans at each of the institutes had been completed and the contract for the Bukalasa Farm Institute was due to be let early in 1956. Staff for this institute has been selected and will take up residence during 1956. The site for the second institute at Arapai was finally decided during the year after considerable difficulties had been overcome in assuring an adequate water supply. It is anticipated that the Arapai contract will be let a few months later than that for Bukalasa. The assistance and co-operation of the Public Works Department for the efficient way in which plans were produced and of the Geological Survey Department for overcoming the water supply difficulties at both sites deserve particular mention.

MECHANISATION OF AGRICULTURE

33. Details of the work undertaken in 1955 by the Special Development Section of the Department will be found in the report of the Chief Agricultural Development Officer. During the year analyses of costs of operating contract hire tractor units in the field have continued and these have yielded valuable results. They have shown that in Acholi and Lango Districts these units are operating efficiently and that the actual cost per acre for the various cultural operations is reasonable and can probably be borne by the crops grown. In Buganda, however, the difficulties of perennial crops, small scattered units and heavier soils raise the cost per acre to a level which is unlikely to be economic with the annual crops grown.

34. Investigations into the economics of mechanisation will continue, but it is clear that the application of mechanisation to peasant farming systems must depend on the operation of tractors by the farmers themselves. At this stage, except in rare instances, such a course is precluded owing to the absence of the technical skill required to keep tractors and implements running. The training of tractor drivers and mechanics has been provided for by the acquisition of Namalere Estate, where a tractor drivers' school will be set up in 1956. A further similar school will be established in the Northern Province at a later date.

35. It should be recorded that Uganda enjoyed the privilege of being the host territory for the C.C.T.A. Agricultural Mechanisation Conference which took place at Entebbe in June, and which was organised by the East Africa High Commission. Apart from the interesting proceedings of the conference, a useful opportunity was afforded to members of the Special Development Section of the Department to meet fellow workers from other territories.

RESEARCH AND INVESTIGATIONS

36. The programme of investigations to be undertaken by the research staff of the Department was widely expanded with the prospect of additional staff, and most of the staff scheduled to be appointed in the 1955/56 financial year under the Agricultural Productivity Committee's recommendations have taken up their duties.

37. Brief summaries of the current work in hand of the Botany, Chemistry and Entomology Sections appear in the appendices to this report. More detailed accounts of this work will be given in this Department's "Record of Investigations" which will be published at a later date. With the appointment of the Senior Agronomist at the end of 1955 the foundation stone of a new Agronomy Section in the Department has been laid, and many farming problems await his attention.

38. To provide the additional staff with full facilities with which to work, plans for laboratory extensions at the Kawanda Research Station and the Serere Experiment Station are well advanced and building will start shortly. The new Robusta Coffee Research Station has been sited at Kituza in south Kyagwe county in Buganda and development of the station awaits the proving of an adequate water supply.

39. A cotton seed dressing programme for the whole Protectorate has been drawn up, based on the results of research undertaken earlier, in which it was shown that dressing of seed with a copper preparation appreciably reduced the incidence of blackarm. In 1955, for the first time, all cotton seed planted was dressed with either *Perecot* or *Armasan* dust at 12 seed dressing stations. Annual blackarm surveys are carried out in September, and the survey undertaken in 1955 revealed the following results which are considered very satisfactory:—

TABLE G

BLACKARM SURVEYS: PERCENTAGE OF PLANT POPULATION INFECTED ON
MAIN STEM

	1950	1951	1952	1953	1954	1955
West Nile	—	23	—	40	56	9*
West Acholi	—	35	—	48	50	4*
East Acholi	—	26	—	45	57	5*
Lango	32	28	25	48	52	4*
North Teso	37	8*	8*	5*	7*	5*
Segregated Areas	15*	6*	2*	3*	4*	3*
South Teso	21*	10*	5*	5*	7*	2*
North Mbale	42	40	31	15*	14*	9*
South Mbale	—	47	7*	8*	10*	15*
Busoga E.-W.	—	—	16	38	60	10*
Busoga S.-N.	—	—	31	47	47	8*
Bugerere	—	—	—	—	64	7*
Kyagwe	—	—	—	6*	19*	9*
Bulemezi	—	—	28	—	11*	5*
Kyadondo	—	—	24	—	—	—
Entebbe	—	—	4*	47	8*	4*
Masaka	—	—	21	17	3*	3*
Singo	—	—	—	49	65	6*
Mubende	—	—	—	46	60	6*
Bunyoro	—	—	—	59	63	7*
No. of seed dressing stations in operation	1	1	3	4	6	12

* dressed seed.

STAFF

40. 1955 saw the strength of the Department increase, both in the field and in the laboratory, and it is gratifying to record that in contrast to the gloomy references in previous annual reports most of both the normal vacancies and those arising from the recommendations of the Agricultural Productivity Committee had been filled by the end of the year. During 1955, four new Agricultural Officers, 17 Field Officers, a Senior Agronomist, two Botanists, an Entomologist, and a Soil Fertility Chemist were appointed. Unfilled vacancies phased for the 1955/56 financial year amounted to three Field Officers and two Soil Survey Officers only.

ACKNOWLEDGMENTS

41. Once again I would like to acknowledge the assistance and co-operation which this Department has received during the year from both official and unofficial bodies and other departments of Government. I would like to thank, in particular, the Minister of Natural Resources and his staff. My thanks are also due to all members of my staff who have shown their usual energy and enthusiasm throughout the year and who have willingly carried out many additional duties which the increased tempo of work has thrown upon them.

42. During the year the Department lost the services of a true friend of Uganda when Mr. R. K. Kerkham, Assistant Director of Agriculture (Special Development) retired after 21 years' service in the Protectorate. Few other men knew the agriculture of Uganda so intimately and his advice and assistance to the farmers in the Protectorate is greatly missed. All his friends were delighted when Her Majesty The Queen graciously awarded him the O.B.E. in the New Year Honours List for his long and outstanding service to the Protectorate.

J. G. M. KING,
Director of Agriculture.

ENTEBBE,
21ST JUNE, 1956.

UGANDA RAINFALL, 1955

Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
ARUA ..	Total: ins.	5.12	2.03	5.96	6.26	8.29	6.21	13.60	11.07	8.18	3.96	3.28	70.30
	Days	10	6	11	12	13	12	23	19	15	6	7	136
	Mean: ins.	0.69	1.87	5.32	5.67	4.75	6.05	7.51	6.64	7.15	3.98	1.69	54.59
GULU ..	Total: ins.	2.17	0.00	5.63	7.08	3.60	8.56	10.70	11.18	6.63	2.34	4.12	64.17
	Days	8	—	10	23	14	17	25	23	18	10	14	170
	Mean: ins.	0.41	1.74	6.75	7.91	5.80	6.68	8.86	6.79	6.40	3.76	1.73	60.16
LIRA ..	Total: ins.	2.80	1.34	4.65	7.48	5.68	6.83	8.39	11.73	7.75	2.19	2.58	62.31
	Days	4	6	5	16	14	16	17	20	16	7	11	142
	Mean: ins.	0.97	1.37	6.71	7.29	5.24	5.11	8.74	6.34	5.54	3.10	1.57	55.42
MOROTO ..	Total: ins.	0.44	1.06	5.69	2.85	1.10	2.20	9.59	4.05	1.25	2.60	1.75	34.23
	Days	3	2	3	6	5	11	16	11	1	4	5	75
	Mean: ins.	0.27	1.21	4.88	5.92	3.50	5.60	4.24	2.07	1.87	1.76	0.91	34.83
SOROTI ..	Total: ins.	0.08	2.26	9.35	4.20	1.84	3.55	10.08	8.25	3.37	4.16	4.06	51.65
	Days	1	5	10	12	8	12	13	18	10	8	7	107
	Mean: ins.	0.75	1.95	7.15	7.50	5.09	4.74	6.97	5.46	4.52	2.83	1.30	51.18
TORORO ..	Total: ins.	4.90	1.73	5.27	10.34	1.27	4.53	2.82	2.15	4.40	3.68	6.69	54.53
	Days	12	8	9	15	10	14	12	16	16	9	15	145
	Mean: ins.	1.71	2.71	8.37	8.50	4.35	4.25	4.79	3.98	4.58	3.87	2.66	55.15
JINJA ..	Total: ins.	3.09	4.05	5.71	7.23	2.68	2.91	4.29	3.60	6.20	2.11	6.11	50.81
	Days	10	9	13	16	7	14	14	16	13	8	9	139
	Mean: ins.	1.69	1.93	4.00	6.66	2.42	2.91	4.52	4.36	3.74	3.71	3.40	47.21
KABALE ..	Total: ins.	2.12	4.38	5.99	1.34	0.35	1.36	2.15	5.12	3.32	3.34	3.80	36.28
	Days	13	15	24	13	2	7	8	18	11	17	18	161
	Mean: ins.	2.29	3.53	4.69	3.70	1.10	0.82	2.07	3.88	3.85	4.13	3.36	38.64
MBARARA	Total: ins.	3.63	3.32	5.69	0.86	0.65	3.31	4.24	6.94	3.47	3.20	5.41	43.71
	Days	12	14	13	7	2	6	15	16	11	11	10	128
	Mean: ins.	1.52	2.43	4.80	3.09	1.01	0.82	2.45	3.83	4.12	4.60	2.84	35.29
FORT PORTAL	Total: ins.	4.05	1.89	5.24	3.16	2.44	4.23	3.50	5.84	7.97	4.19	8.43	57.22
	Days	12	13	20	11	12	19	23	28	22	20	18	218
	Mean: ins.	1.25	2.92	7.33	5.70	3.30	2.30	4.65	7.60	8.37	6.47	2.83	58.06

Appendix I—continued

Station		Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
HOMA ..	Total: ins.	3.50	0.63	3.01	4.45	2.59	3.73	3.49	5.85	8.03	7.39	1.81	6.54	52.82
	Days	8	5	9	14	9	8	13	18	21	16	11	12	144
MASAKA ..	Mean: ins.	1.17	2.81	4.64	6.77	5.94	3.55	3.93	5.86	7.03	6.90	5.15	2.45	56.20
	Total: ins.	1.93	1.44	0.78	6.74	5.73	0.85	0.97	2.13	2.88	2.56	2.79	6.22	35.02
	Days	7	10	3	15	10	2	1	4	5	6	7	10	80
	Mean: ins.	2.00	2.44	4.44	7.01	6.83	1.78	1.41	2.16	3.53	3.87	3.80	3.37	42.64
KAKUMIRO	Total: ins.	2.45	2.02	3.49	8.07	4.10	1.53	8.60	5.42	8.79	5.58	3.70	5.90	59.65
	Days	12	2	11	16	12	4	11	13	19	18	16	15	149
	Mean: ins.	1.32	2.33	4.56	6.62	4.03	2.93	2.64	5.38	6.83	7.12	5.49	2.69	51.94
MITYANA ...	Total: ins.	3.39	1.49	4.23	3.98	5.07	1.72	5.64	6.48	4.70	5.58	3.07	4.31	49.66
	Days	10	7	12	16	15	7	10	15	19	15	10	14	150
	Mean: ins.	1.75	2.87	4.16	5.77	4.43	2.38	1.59	3.84	3.81	5.12	4.51	2.88	43.11
KAMPALA	Total: ins.	3.40	5.54	6.31	7.92	5.31	2.21	3.04	6.72	4.64	2.19	2.37	3.91	53.56
	Days	10	14	15	15	17	5	12	13	14	16	9	13	153
	Mean: ins.	2.13	2.07	3.57	6.18	6.25	2.68	2.38	4.12	3.86	4.12	4.02	3.19	44.57
ENTEBBE ..	Total: ins.	4.60	1.98	6.79	13.27	15.49	2.70	2.90	2.42	1.82	1.07	2.14	4.67	59.85
	Days	7	8	15	21	16	8	10	8	7	6	8	14	128
	Mean: ins.	2.61	3.45	6.16	10.13	9.68	4.61	3.03	2.97	3.09	3.66	5.07	4.47	58.02

COTTON PRODUCTION—1954/55 SEASON

PROVINCE AND ZONE	ACREAGE		SALES IN TONS		YIELDS PER ACRE LB.	
	Totals	Means	Totals	Means	Totals	Means
	1954/55	1948/49- 1954/55	1954/55	1948/49- 1954/55	1954/55	1948/49- 1954/55
<i>Buganda—</i>						
Mengo	333,176	340,245	46,367	61,942	312	408
Masaka	34,283	41,771	3,688	7,261	241	389
Mubende	64,483	60,683	7,953	11,262	276	416
TOTAL ..	431,942	442,699	58,008	80,465	301	407
<i>Eastern—</i>						
Busoga	356,631	284,370	36,976	44,259	232	349
North Mbale ..	191,298	173,288	13,031	16,669	153	215
South Mbale ..	153,256	150,856	13,362	13,462	195	200
South Teso ..	60,479	61,869	4,999	5,303	185	192
South Teso Segregated ..	38,667	34,167	3,577	4,292	207	281
North Teso ..	60,443	49,519	5,564	4,446	206	201
Usuku	17,541	15,251	2,276	1,946	291	286
TOTAL ..	878,315*	769,320	79,785†	90,377	204	263
<i>Western—</i>						
Bunyoro	30,325	27,517	4,341	4,295	321	350
Toro	35,534	25,245	2,385	2,692	150	239
TOTAL ..	65,859	52,762	6,726	6,987	229	297
<i>Northern—</i>						
Lango	196,908	184,237	14,985	16,606	170	202
East Acholi & Karamoja ..	61,313	38,297	4,401	4,359	161	255
West Acholi ..	42,792	36,307	6,664	5,201	349	321
West Nile ..	61,692	55,800	5,313	5,627	193	226
TOTAL ..	362,705*	314,642	31,363†	31,793	194	226
PROTECTORATE TOTALS ..	1,738,821	1,579,423	175,882	209,623	227	297

*These figures do not agree with Provincial totals as shown in Tables III(a) III(c), and III(e) due to the fact that the boundaries of the zones listed under Eastern and Northern Provinces do not coincide with provincial boundaries. The difference is compensating and the Protectorate totals in Tables II(a) and III(a) agree.

†Similarly these figures do not agree with those in Table IV; the Protectorate totals, however, agree.

COTTON PRODUCTION—1955/56 SEASON

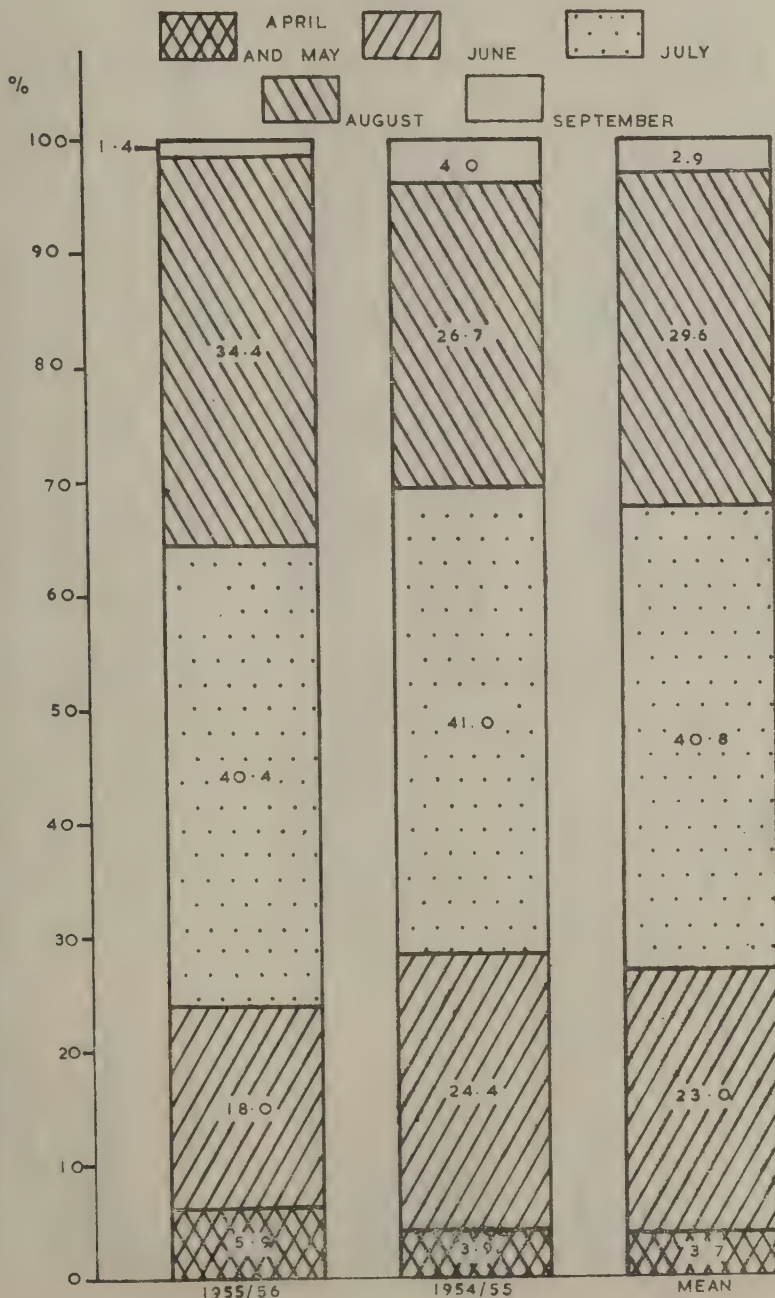
Monthly Plantings—Acres

Province/Zone	April	May	June	July	August	September	TOTAL
<i>Buganda—</i>							
Mengo ..	—	177	35,942	124,166	125,598	4,162	290,045
Masaka ..	—	2,071	6,108	7,479	15,734	1,749	33,141
Mubende ..	—	1,774	5,768	21,910	19,476	1,447	50,375
TOTAL ..	—	4,022	47,818	153,555	160,808	7,358	373,561
<i>Eastern—</i>							
Busoga ..	—	16,712	65,973	146,617	106,634	—	335,936
North Mbale } ..	606	17,226	65,904	149,001	117,152	—	349,889
South Mbale } ..	412	13,274	14,924	16,714	11,690	—	57,014
South Teso ..	114	6,292	5,273	11,058	11,146	—	33,883
Segregated ..	345	14,468	9,138	19,526	11,690	—	55,167
North Teso ..	177	8,661	2,885	1,651	93	—	13,467
Usuku ..							
TOTAL ..	1,654	76,633	164,097	344,567	258,405	—	845,356*
<i>Western—</i>							
Bunyoro ..	—	165	8,886	15,271	6,682	—	31,004
Toro ..	—	—	—	3,208	16,075	11,277	30,560
TOTAL ..	—	165	8,886	18,479	22,757	11,277	61,564
<i>Northern—</i>							
Lango ..	258	7,535	29,831	63,233	50,265	787	151,909
East Acholi and Karamoja ..	9	3,107	14,446	21,653	10,912	—	50,127
West Acholi ..	—	211	7,766	18,936	11,224	1,535	39,672
West Nile ..	—	93	12,148	20,179	30,215	676	63,311
TOTAL ..	267	10,946	64,191	124,001	102,616	2,998	305,019*
PROTECTORATE TOTALS ..	1,921	91,766	284,992	640,602	544,586	21,633	1,585,500

*These figures do not agree with those in Tables III(a) III(c) and III(e) due to the fact that the boundaries of the zones listed under Eastern and Northern Provinces do not coincide with the provincial boundaries. The differences are compensating; the Protectorate totals agree.

COTTON

MONTHLY PLANTINGS AS PERCENTAGES OF TOTAL



COTTON—MONTHLY PLANTINGS AS PERCENTAGES OF TOTAL *Appendix II (c)*

Province and Zone	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	1955-56	Mean 1950-51 1954-55	1955-56	Mean 1950-51 1954-55	1955-56	Mean 1950-51 1954-55	1955-56	Mean 1950-51 1954-55	1955-56	Mean 1950-51 1954-55	1955-56	Mean 1950-51 1954-55
<i>Buyanda</i> —												
Mengo ..	—	—	0.1	0.5	12.4	18.4	42.8	41.4	43.3	35.8	1.4	3.9
Masaka ..	—	—	6.2	4.7	18.4	20.6	22.6	22.6	47.5	31.1	5.3	21.0
Mubende ..	—	—	3.5	2.4	11.4	21.1	43.5	36.5	38.7	35.5	2.9	4.5
PROVINCIAL AVERAGE ..	—	—	1.1	1.1	12.8	18.9	41.1	39.0	43.0	35.4	2.0	5.6
<i>Eastern</i> —												
Busoga ..	—	—	4.9	3.9	19.6	23.8	43.7	41.1	31.8	28.9	—	2.3
North Mbale ..	—	—	4.9	3.6	18.8	23.5	42.6	43.1	33.5	29.1	—	0.7
South Mbale ..	0.2	—	—	—	—	—	—	—	—	—	—	—
South Teso ..	0.7	0.3	23.3	13.0	26.2	35.9	29.3	31.9	20.5	18.3	—	0.6
South Teso Segregated ..	0.3	0.1	18.6	10.2	15.6	34.8	32.6	29.3	32.9	25.0	—	0.6
North Teso ..	0.6	0.1	26.2	10.6	16.6	41.1	35.4	33.3	21.2	15.8	—	—
Usuku ..	1.3	7.6	64.3	46.8	21.4	34.0	12.3	10.7	0.7	0.9	—	—
PROVINCIAL AVERAGE ..	0.2	0.2	9.0	6.0	19.4	26.4	40.8	39.5	30.6	26.6	—	1.3
<i>Western</i> —												
Bunyoro ..	—	—	0.5	3.3	28.7	23.3	49.3	46.7	21.5	24.3	—	2.4
Toro ..	—	—	—	—	—	0.5	10.5	15.6	52.6	53.8	36.9	30.1
PROVINCIAL AVERAGE ..	—	—	0.3	1.6	14.4	12.1	30.0	31.4	37.0	38.8	18.3	16.1
<i>Northern</i> —												
Lango ..	0.2	0.2	5.0	1.5	19.6	24.2	41.6	46.5	33.1	26.8	0.5	0.8
East Acholi and Karamoja ..	—	—	6.2	2.5	28.8	21.1	43.2	50.9	21.8	24.8	—	0.7
West Acholi ..	—	—	0.5	0.8	19.6	18.5	47.7	52.8	28.3	27.6	3.9	0.3
West Nile ..	—	—	0.1	0.5	19.2	18.4	31.9	47.0	47.7	32.7	1.1	1.4
PROVINCIAL AVERAGE ..	0.1	0.1	3.6	1.3	21.0	22.1	40.7	47.9	33.6	27.7	1.0	0.9
PROTECTORATE AVERAGE	0.1	0.1	5.8	3.6	18.0	23.0	40.4	40.8	34.3	29.6	1.4	2.9

COTTON PRODUCTION

(No. of Bales of 400 lb. 1907-55)

(Note: All figures are corrected to 1,000 bales)

Season	Bales (Actual)	Bales (5 year average)	Season	Bales (Actual)	Bales (5 year average)
1907	2,000	—	1930-31 ..	189,000	204,000
1908	4,000	—	1931-32 ..	207,000	220,000
1909	5,000	9,000	1932-33 ..	295,000	246,000
1910	12,000	13,000	1933-34 ..	286,000	271,000
1911	20,000	21,000	1934-35 ..	253,000	296,000
1912-13 ..	26,000	25,000	1935-36 ..	316,000	321,000
1913-14 ..	40,000	27,000	1936-37 ..	332,000	325,000
1914-15 ..	26,000	28,000	1937-38 ..	418,000	335,000
1915-16 ..	22,000	29,000	1938-39 ..	307,000	344,000
1916-17 ..	28,000	26,000	1939-40 ..	300,000	326,000
1917-18 ..	27,000	30,000	1940-41 ..	365,000	264,000
1918-19 ..	36,000	44,000	1941-42 ..	238,000	241,000
1919-20 ..	47,000	48,000	1942-43 ..	112,000	236,000
1920-21 ..	81,000	60,000	1943-44 ..	191,000	208,000
1921-22 ..	48,000	78,000	1944-45 ..	272,000	207,000
1922-23 ..	88,000	108,000	1945-46 ..	227,000	218,000
1923-24 ..	128,000	128,000	1946-47 ..	231,000	258,000
1924-25 ..	196,000	145,000	1947-48 ..	170,000	272,000
1925-26 ..	180,000	155,000	1948-49 ..	391,000	295,000
1926-27 ..	131,000	170,000	1949-50 ..	339,000	325,000
1927-28 ..	138,000	156,000	1950-51 ..	346,000	355,000
1928-29 ..	204,000	157,000	1951-52 ..	380,000	357,000
1929-30 ..	125,000	173,000	1952-53 ..	320,000	349,000
			1953-54 ..	398,000	—
			1954-55 ..	300,000	—

CROP PRODUCTION
Estimated Acreages under Crops—1954 and 1955
African Cultivation

Crop	BUGANDA		EASTERN		NORTHERN		WESTERN		TOTAL	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Bambarra Nuts	—	—	430	325	—	—	107,204	—	430	325
Beans, Mixed ..	213,159	151,753	148,441	172,624	136,736	92,597	—	113,595	605,540	530,569
Beans, Soya ..	10,335	2,042	5	—	1,020	1,754	2,556	1,754	13,284	4,816
Cassava ..	64,282	57,569	251,338	202,290	206,795	182,539	71,336	79,374	593,751	521,772
Chillies ..	15	11	—	—	—	—	8	17	23	28
Coffee, Arabica ..	1,400	1,400	17,000	17,823	50	389	5,372	5,948	23,822	25,560
Coffee, Robusta ..	253,048	279,954	1,104	1,273	15	15	7,661	10,323	261,828	291,565
Cotton ..	431,942	373,561	904,326	882,881	336,694	267,494	65,859	61,564	1,738,821	1,585,500
Flax ..	—	—	—	—	—	—	470	—	470	—
Gram ..	18,366	2,612	—	1,304	3,492	4,837	16	4	21,874	8,757
Groundnuts ..	87,693	90,869	173,589	230,225	92,823	85,401	22,684	19,042	376,789	425,537
Maize ..	229,525	121,148	138,790	148,915	46,933	51,027	56,444	58,474	471,692	379,564
Millet, Sorghum ..	27,077	33,647	178,593	152,804	270,473	160,774	186,007	183,823	662,150	531,048
Millet, Finger ..	27,833	25,735	724,432	712,755	340,877	341,830	131,964	138,029	1,225,106	1,218,349
Millet, Bulrush ..	—	—	2,754	3,002	—	3,908	—	—	6,297	6,910
Onions ..	—	—	2	—	—	—	1,993	1,760	1,995	1,760
Peas, Pigeon ..	—	—	1,465	2,063	228,066	217,826	672	1,078	230,203	220,967
Peas, Field ..	—	—	—	—	—	—	28,794	34,806	28,794	34,806
Plantains ..	570,881	603,500	587,685	437,517	840	1,235	367,958	371,887	1,527,364	1,414,139
Potatoes, Sweet ..	141,550	116,827	186,770	204,195	92,558	100,873	141,094	160,920	561,972	582,815
Potatoes, English ..	—	—	3,122	4,108	—	—	9,195	10,968	12,317	15,076
Rice ..	—	—	4,278	1,201	1,133	866	2,620	2,574	8,031	4,641
Simsim ..	7,094	3,248	28,761	26,504	211,394	180,506	6,485	6,483	253,734	216,741
Sunflower ..	—	—	—	—	873	94	51	11	924	105
Sunn-Hemp ..	—	—	136	649	—	—	—	—	136	649
Tobacco, Flue-cured ..	—	—	—	—	2,337	2,618	157	201	2,494	2,819
Tobacco, Fire-cured ..	697	979	28	1	—	—	3,519	3,497	4,244	4,477
Tobacco, Air-cured ..	330	310	—	—	1,285	1,198	190	540	1,805	2,048
Wheat ..	—	—	126	100	—	—	7,039	1,422	7,165	1,522
TOTAL	2,085,227	1,865,165	3,353,175	3,202,559	1,977,305	1,697,047	1,227,348	1,268,094	8,643,055	8,032,865

CROP PRODUCTION
Estimated Acreages under Crops—1954 and 1955
African Cultivation
BUCANDA PROVINCE

Crop	MENGO		MASAKA		MUBENDE		PROVINCIAL TOTAL	
	1954	1955	1954	1955	1954	1955	1954	1955
Beans, Mixed	152,472	103,048	41,726	27,766	18,961	20,939	213,159	151,753
Beans, Soya	4,575	2,042	5,760	—	—	—	10,335	2,042
Cassava	41,694	38,769	9,686	6,755	12,902	12,045	64,282	57,569
Chillies	—	—	—	—	15	11	15	11
Coffee, Arabica	1,200	1,200	100	100	100	100	1,400	1,400
Coffee, Robusta	176,785	194,460	66,299	72,930	9,964	12,564	253,048	279,954
Cotton	372,222	322,266	34,283	33,141	25,437	18,154	431,942	373,561
Gram	16,749	903	1,617	1,709	—	—	18,366	2,612
Groundnuts	59,960	69,380	16,864	8,069	10,869	13,420	87,693	90,869
Maize	180,619	110,568	44,096	5,622	4,810	4,958	229,525	121,148
Millet, Sorghum	10,411	19,804	12,813	8,069	3,853	5,774	27,077	33,647
Millet, Finger	20,583	18,821	3,245	890	4,005	6,024	27,833	25,735
Plantains	333,121	333,654	177,419	194,420	60,341	75,426	570,881	603,500
Potatoes, Sweet	97,732	85,683	24,662	19,248	19,156	11,896	141,550	116,827
Potatoes, English	—	—	—	—	—	—	—	—
Simsim	5,424	1,995	—	—	1,670	1,253	7,094	3,248
Tobacco, Fire-cured	—	—	—	—	697	979	697	979
Tobacco, Air-cured	—	—	—	—	330	310	330	310
TOTAL	1,473,547	1,302,593	438,570	378,719	173,110	183,853	2,085,227	1,865,165

CROP PRODUCTION

Estimated Acreages under Crops—1954 and 1955

African Cultivation
EASTERN PROVINCE

Crop	BUSOGA		BUGISU		BUKEDI		TESO		PROVINCIAL TOTAL	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Bambara Nuts	—	—	—	—	—	—	430	325	430	325
Beans, Mixed	19,322	22,435	40,295	20,934	18,850	35,886	69,974	93,369	148,441	172,624
Beans, Soya	—	—	—	—	—	—	5	—	5	—
Cassava	78,967	43,762	32,354	18,640	59,131	58,678	80,886	81,210	251,338	202,290
Coffee, Arabica	—	—	17,000	17,823	—	—	—	—	17,000	17,823
Coffee, Robusta	1,104	1,273	—	—	—	—	—	—	1,104	1,273
Cotton	356,631	335,936	62,360	58,746	233,274	225,815	252,061	262,384	904,326	882,881
Groundnuts	43,881	78,857	7,669	11,465	32,401	52,032	89,638	87,871	173,589	230,225
Maize	46,219	91,355	49,539	32,524	35,775	18,785	7,257	6,251	138,790	148,915
Millet, Sorghum	1,051	1,374	12,136	10,891	14,935	14,041	150,471	126,498	178,593	152,804
Millet, Finger	181,967	139,280	73,070	82,763	178,572	191,629	290,823	299,084	724,432	712,755
Millet, Bulrush	—	—	—	—	—	—	2	—	2	—
Peas, Pigeon	—	—	—	—	—	—	1,465	2,063	1,465	2,063
Plantains	182,000	183,608	405,385	200,000	—	51,500	300	2,409	587,685	437,517
Potatoes, Sweet	49,240	77,113	16,687	14,357	40,618	34,601	80,225	78,124	186,770	204,195
Potatoes, English	—	—	3,122	4,108	—	—	—	—	3,122	4,108
Rice	2,424	41	55	6	121	235	1,678	919	4,278	1,201
Simsim	1,569	2,898	123	26	887	648	26,182	22,932	28,761	26,504
Sunn-Hemp	—	—	—	—	—	—	136	649	136	649
Tobacco, Fire-cured	—	—	—	100	—	—	28	1	28	1
Wheat	—	—	—	—	—	—	—	—	—	—
Grams	—	—	126	—	—	—	—	—	126	100
TOTAL	964,375	977,932	719,921	472,382	614,564	683,850	1,054,315	1,068,395	3,353,175	3,202,559

CROP PRODUCTION
Estimated Acreages under Crops—1954 and 1955
African Cultivation
WESTERN PROVINCE

Crop	ANKOLE		BUNYORO		KIGEZI		TORO		PROVINCIAL TOTAL	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Beans, Mixed	13,911	15,462	11,000	8,834	46,417	56,419	35,876	32,880	107,204	113,595
Beans, Soya	2,468	1,667	17,576	28,318	50	—	38	87	2,556	1,754
Cassava	5,315	10,564	—	—	2,385	1,892	46,060	38,600	71,336	79,374
Chillies	—	—	—	—	5	10	3	7	8	17
Coffee, Arabica	2,825	3,436	—	—	545	314	2,002	2,198	5,372	5,948
Coffee, Robusta	3,993	6,291	830	913	417	415	2,421	2,704	7,661	10,323
Cotton	—	—	30,325	31,004	—	—	35,534	30,560	65,859	61,564
Flax	128	—	—	—	342	—	—	—	470	—
Gram	16	—	—	—	—	—	—	4	16	4
Groundnuts	6,557	6,066	4,834	5,051	3,366	1,519	7,927	6,406	22,684	19,042
Maize	3,841	4,407	6,016	6,986	23,484	27,164	23,103	19,917	56,444	58,474
Millet, Sorghum	12,345	14,683	1,318	1,189	168,614	163,182	3,730	4,769	186,007	183,823
Millet, Finger	31,951	41,570	14,877	17,419	54,733	51,398	30,403	27,642	131,964	138,029
Onions	960	729	216	119	384	648	433	264	1,993	1,760
Peas, Field	4,418	6,979	—	—	24,302	27,776	74	51	28,798	34,806
Peas, Pigeon	—	—	487	950	—	—	185	128	672	1,078
Plantains	263,451	264,163	19,000	19,120	64,327	65,963	21,180	22,641	367,958	371,887
Potatoes, Sweet	20,491	23,814	12,608	11,098	93,002	106,590	14,993	19,418	141,094	160,920
Potatoes, English	30	147	5	7	9,032	10,520	128	294	9,195	10,968
Rice	—	—	—	—	—	1	2,620	2,573	2,620	2,574
Simsim	6	3	6,363	6,363	—	—	116	117	6,485	6,483
Sunflower	—	—	—	—	51	11	—	—	51	11
Tobacco, Air-cured	—	—	—	—	190	540	—	—	190	540
Tobacco, Fire-cured	—	—	3,519	3,497	—	201	—	—	3,519	3,497
Tobacco, Flue-cured	—	—	—	—	157	—	—	—	157	201
Wheat	—	—	—	—	6,761	1,135	278	287	7,039	1,422
TOTAL	372,706	399,981	128,974	140,868	498,564	515,698	227,104	211,547	1,227,348	1,268,094

CROP PRODUCTION
Estimated Acreages under Crops—1954 and 1955
African Cultivation
NORTHERN PROVINCE

Crop	LANGO		ACHOLI		WEST NILE, MADI		KARAMOJA		PROVINCIAL TOTAL	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Beans, Mixed	54,003	35,140	26,249	13,687	56,484	43,770	—	—	136,736	92,597
Beans, Soya	388	1,020	—	—	—	—	—	—	388	1,020
Cassava	61,892	52,249	34,747	31,596	110,056	98,594	100	100	206,795	182,539
Coffee, Arabica	—	—	—	—	50	389	—	—	50	389
Coffee, Robusta	—	—	—	—	15	15	—	—	15	15
Cotton	176,450	119,348	96,583	82,988	61,692	63,311	1,969	1,847	336,694	267,494
Gram	—	173	—	—	3,492	4,664	—	—	3,492	4,837
Groundnuts	41,062	25,961	29,517	20,972	21,594	36,968	650	1,500	92,823	85,401
Maize	8,968	7,869	2,372	2,131	33,593	38,527	2,000	2,500	46,933	51,027
Millet, Sorghum	165,769	75,975	40,037	40,744	24,667	24,055	40,000	20,000	270,473	160,774
Millet, Finger	*172,469	*154,894	87,997	110,347	77,911	73,589	2,500	3,000	340,877	341,830
Millet, Bulrush	—	—	1,543	1,908	—	—	2,000	2,000	3,543	3,908
Peas, Pigeon	*172,469	*154,894	50,000	50,000	5,597	12,932	—	—	228,066	217,826
Plantains	268	268	—	—	572	967	—	—	840	1,235
Potatoes, Sweet	29,280	20,398	22,832	28,609	39,446	50,866	1,000	1,000	92,558	100,873
Rice	615	310	139	54	379	502	—	—	1,133	866
Simsim	99,033	59,292	74,050	72,877	38,061	45,837	250	2,500	211,394	180,506
Sunflower	—	—	—	—	873	94	—	—	873	94
Tobacco, Air-cured	—	—	—	—	1,285	1,198	—	—	1,285	1,198
Tobacco, Flue-cured	84	19	750	942	1,503	1,657	—	—	2,337	2,618
TOTAL	982,750	707,810	466,816	456,855	477,270	497,935	50,469	34,447	1,977,305	1,697,047

* Interplanted

CROP PRODUCTION, 1955

Quantities Marketed and Estimated Values (African Production)

(Values based on prices to growers)

Province/District	Coffee Arabica		Coffee Robusta		Cotton		Flax Seed		Flax Straw		Tobacco Flue-cured		Tobacco Air-cured <i>c</i>		Tobacco Fire-cured <i>c</i>		Total Value	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	1955	1954
	Tons	£	Tons	£	Tons	£	Tons	£	Tons	£	Tons	£	Tons	£	Tons	£	£	£
Eastern Province—																		
Busoga	—	—	299 <i>k</i>	24,073	36,976	2,423,184	—	—	—	—	—	—	—	—	—	—	2,447,257	3,002,518
Bugisu	6,170 <i>p</i>	2,015,662	—	—	6,938	451,895	—	—	—	—	—	—	—	—	—	—	2,467,557	} 3,217,894
Bukedi	—	—	—	—	16,671	1,085,772	—	—	—	—	—	—	—	—	—	—	1,085,772	
Teso	—	—	—	—	20,994	1,384,363	—	—	—	—	—	—	—	—	—	—	1,384,363	1,214,068
TOTAL ..	6,170	2,015,662	299	24,073	81,579	5,345,214	—	—	—	—	—	—	—	—	—	—	7,384,949	7,434,480
Northern Province—																		
Lango	—	—	—	—	13,924	906,477	—	—	—	—	3 <i>c</i>	541	—	—	—	—	907,018	864,557
											8 <i>c</i>	2,429	—	—	—	—	683,571	466,736
											950 <i>g</i>	7,942	—	—	—	—	1,553	448
Acholi	—	—	—	—	10,309	673,200	—	—	—	—	—	—	—	—	—	—	389,074	502,014
Karamoja	—	—	—	—	23	1,553	—	—	—	—	5 <i>c</i>	1,008	—	—	—	—		
											1,889 <i>g</i>	17,711	266	27,290	—	—		
West Nile/Madi ..	2	700	—	—	5,313	342,365	—	—	—	—	16 <i>c</i>	3,978	—	—	—	—	1,981,216	1,833,795
											2,839 <i>g</i>	25,653	266	27,290	—	—		
TOTAL ..	2	700	—	—	29,569	1,923,595	—	—	—	—	—	—	266	27,290	—	—	1,981,216	1,833,795
Western Province—																		
Bunyoro	—	—	126 <i>k</i>	16,317	4,341	282,579	—	—	—	—	—	—	—	—	862	90,059	388,955	374,791
Toro	150 <i>h</i>	45,131	900 <i>h</i>	215,522	2,385	156,400	—	—	—	—	—	—	—	—	—	—	417,053	380,178
Ankole	92 <i>h</i>	23,910	198 <i>h</i>	34,017	—	—	8	126	54	360	—	—	—	—	—	—	58,413	34,265
Kigezi	2 <i>h</i>	471	1 <i>h</i>	157	—	—	45	712	269	1,835	146 <i>g</i>	1,312	24	1,869	—	—	6,356	7,676
TOTAL ..	244	69,512	1,225	266,013	6,726	438,979	53	838	323	2,195	146 <i>g</i>	1,312	24	1,869	862	90,059	870,777	796,910
Buganda Province—																		
Mengo	687 <i>k</i>	44,341	77,433 <i>k</i>	9,195,471	51,715	3,453,180	—	—	—	—	—	—	—	—	—	—	12,692,992	8,485,957
Masaka	388 <i>k</i>	10,242	41,214 <i>k</i>	4,380,960	3,688	250,998	—	—	—	—	—	—	—	—	—	—	4,642,200	2,503,811
Mubende	111 <i>k</i>	7,207	467 <i>k</i>	55,505	2,605	172,150	—	—	—	—	—	—	81	8,473	205	21,257	264,592	276,198
TOTAL ..	1,186	61,790	119,114	13,631,936	58,008	3,876,328	—	—	—	—	—	—	81	8,473	205	21,257	17,599,784	11,265,966
PROTECTORATE TOTALS ..	7,602	2,147,664	120,638	13,922,022	175,882	11,584,116	53	838	323	2,195	16 <i>c</i>	3,978	371 <i>c</i>	37,632	1,067 <i>c</i>	111,316	27,836,726	21,331,111

NOTE.—Crops included in this table are those for which figures for quantities marketed and estimated values are known with accuracy.

Crops such as maize, groundnuts, etc., of which considerable quantities are marketed are not included.

h = Rough hulled.*p* = Parchment.*k* = Kiboko.*c* = Cured leaf.*g* = Green leaf.

OVERSEAS EXPORTS OF AGRICULTURAL PRODUCTS, 1955

ARTICLE	UNIT	QUANTITIES			VALUE IN £		
		1953	1954	1955	1953	1954	1955
<i>Oilseeds and Products :</i>							
Cotton Seed ..	Tons	32,144	295	37	639,510	5,882	740
Castor Seed ..	Tons	14,990	7,621	3,348	850,002	320,399	132,694
Groundnuts ..	Tons	1,013	7,718	9,057	63,874	541,808	514,263
Linseed ..	Tons	25	48	55	1,219	1,920	2,742
Sesame Seed ..	Tons	—	516	80	—	40,685	6,186
Sunflower Seed ..	Tons	—	365	172	—	12,848	6,053
Cotton Seed Cake ..	Tons	33,410	59,782	47,770	796,928	1,559,538	1,359,519
Groundnut and Sesame Cake ..	Tons	452	—	—	14,773	—	—
Coconut Cake ..	Tons	—	47	60	—	985	1,400
Cotton Seed Oil ..	Tons	—	2,575	252	—	298,873	28,697
Groundnut Oil ..	Tons	—	122	11	—	17,096	1,234
Edible Oils and Fats ..	Tons	3,093	—	—	351,126	—	—
Other Oilseed Cake, Meals and other Vegetable Oil Residues ..	Tons	858	815	1,730	21,246	27,771	59,837
<i>Fibres :</i>							
Cotton, Raw ..	Tons	59,222	70,242	54,683	16,802,041	20,877,232	16,386,431
Sisal ..	Tons	972	535	619	83,037	31,504	35,282
Flax ..	Tons	21	20	34	3,656	2,088	3,758
<i>Beverage Crops and Tobacco :</i>							
Coffee, not roasted ..	Tons	35,679	34,647	74,442	11,543,404	13,477,528	20,134,103
Tea ..	Tons	1,250	2,194	2,255	355,656	950,032	1,062,486
Unmanufactured Tobacco ..	Tons	56	—	51	12,557	—	8,870
Cigarettes ..	Lb.	117,097	106,617	121,183	11,147	9,182	10,961

<i>Spices and Drugs :</i>											
Chillies	..	..	..	Tons	538	353	203	81,581	77,478	56,375	
Cinchona Bark	..	..	..	Tons	15	—	—	2,274	—	—	
Papain	..	..	..	Tons	22	31	24	73,392	48,007	29,627	
Vanilla	..	..	..	Tons	—	3	2	—	6,540	7,383	
<i>Beans and Pulses :</i>											
Soya Beans	..	..	..	Tons	673	1,257	2,147	32,941	53,754	71,246	
Other	..	..	..	Tons	2,944	2,895	632	119,394	86,442	17,980	
<i>Cereals :</i>											
Maize	..	..	..	Tons	—	14,400	13,422	—	293,595	276,576	
Millet	..	..	..	Tons	29	10	5	905	410	168	
<i>Miscellaneous :</i>											
Rubber	..	..	..	Tons	45	45	35	11,450	7,384	7,789	
Wattle Bark	..	..	..	Tons	523	122	—	12,151	2,630	—	
Ethyl Alcohol	..	..	..	Proof Gals.	203	484	11,556	70	184	3,920	
Total								£	31,884,334	38,751,795	40,226,320

EXPORTS OF AGRICULTURAL PRODUCTS TO KENYA AND TANGANYIKA, 1955

ARTICLE	UNIT	QUANTITY		VALUE IN £		
		To Kenya	To Tanganyika	Total	To Kenya	To Tanganyika
<i>Oilseeds and Products :</i>						
Cotton Seed Cake	Tons	922	—	922	24,021	—
Other Oilseed Cakes and other Vegetable Oil Residues	Tons	121	—	121	4,411	—
Coconut Cake	Tons	89	—	89	1,937	—
Sesame Seed	Tons	23	—	23	1,374	—
Groundnuts	Tons	189	464	653	24,515	24,515
Cotton Seed Oil	Tons	3,126	1,433	4,259	316,576	116,085
Groundnut Oil	Tons	97	54	151	10,918	5,643
Other Vegetable Oils	Tons	16	2	18	1,991	406
<i>Beverage Crops and Tobacco :</i>						
Coffee, not roasted	Tons	44	—	44	17,450	—
Tea	Tons	36	8	44	15,945	4,813
Unmanufactured Tobacco	Lb.	221,560	—	221,560	34,357	—
Cigars, Cheroots and Manufactured Tobacco	Lb.	83,917	15,827	99,744	78,335	14,253
<i>Spices :</i>						
Chillies	Tons	3	1	4	540	160
<i>Beans and Pulses :</i>						
Soya Beans	Tons	1	—	1	31	—
Other	Tons	1,791	263	2,054	44,455	7,535
<i>Cereals :</i>						
Maize	Tons	—	675	675	—	14,992
Millet	Tons	—	1,285	1,285	—	38,699
<i>Miscellaneous :</i>						
Rubber	Tons	43	—	43	10,554	—
Ethyl Alcohol	Proof Gals.	1,879	271	2,150	603	84
Sugar	Tons	13,173	361	13,534	811,751	22,248
				TOTAL	1,387,459	249,433
				£		1,636,892

CROP PRODUCTION—UGANDA

Non-African Production, 1955

Crop	ESTIMATED ACREAGE		ESTIMATED PRODUCTION			
	1954	1955	Quantity		Value	
			1954	1955	1954	1955
			<i>Tons</i>	<i>Tons</i>	<i>£</i>	<i>£</i>
Coffee (Robusta)	17,767	18,330	5,277	7,730	2,100,993	1,944,790
Coffee (Arabica)	2,281	3,204	632	784	322,892	298,321
Sugar	28,026	27,915	40,812	65,130	1,957,170	3,390,632
Sisal	9,000	7,000	1,200	669	72,000	39,320
Tea	9,278	10,059	2,797	3,107	1,174,698	1,944,790
TOTAL ..	66,352	66,508	—	—	5,627,753	7,617,853

POPULATION AND AVAILABILITY OF LAND

Appendix VII

Province/District	Total area	Areas of land excluding open water and reserved forests	Cultivated area	Population*	Population density	Cultivated land per head of the population	Estimated available land per head of the population	Ratio of available land to land used
	Sq. miles	Sq. miles	Acres		Per sq. mile	Acres	Acres	
<i>Buganda—</i>								
Mengo ..	14,589	10,048	1,099,959	899,596	90	1.2	7.1	5.9
Masaka ..	8,122	3,968	360,698	317,688	80	1.1	8.0	7.3
Mubende ..	2,679	2,584	172,580	84,878	33	2.0	19.5	9.8
TOTAL ..	25,390	16,600	1,633,237	1,302,162	78	1.3	8.2	6.3
<i>Eastern Province—</i>								
Busoga ..	6,876	3,399	756,744	505,998	149	1.5	4.3	2.9
Bugisu, Bukedi ..	3,367	2,869	877,831	599,950	209	1.5	3.1	2.1
Teso ..	4,990	4,519	736,234	402,564	89	1.8	7.2	4.0
TOTAL ..	15,233	10,787	2,370,809	1,508,512	140	1.6	4.6	2.9
<i>Northern Province—</i>								
Acholi ..	11,176	10,703	354,249	215,655	20	1.6	31.8	19.9
Lango ..	4,898	4,519	459,801	265,890	59	1.7	10.9	6.4
Karamoja ..	11,472	10,336	30,531	125,567	12	0.2	52.7	263.5
West Nile/Madi ..	6,061	5,294	583,596	336,063	63	1.7	10.1	5.9
TOTAL ..	33,607	30,852	1,428,177	943,175	31	1.5	20.9	13.9
<i>Western Province—</i>								
Bunyoro ..	6,011	4,198	131,640	108,380	26	1.2	24.8	20.7
Toro ..	5,380	4,319	188,347	258,873	60	0.7	10.7	15.3
Ankole ..	6,320	5,621	365,091	400,924	71	0.9	9.0	10.0
Kigezi ..	2,040	1,757	377,191	395,529	225	1.0	2.8	2.8
TOTAL ..	19,751	15,895	1,062,269	1,163,706	73	0.9	8.7	9.7
PROTECTORATE TOTAL ..	93,981	74,134	6,494,482	4,917,553	66	1.3	9.6	7.4

* 1948 Census figures

DEPARTMENT OF AGRICULTURE STAFF POSTINGS AS AT 31st DECEMBER, 1955

A. Administrative

Title	Name	Station	Remarks
<i>Director of Agriculture</i>	J. G. M. KING, O.B.E.	Entebbe.	
<i>Deputy Director of Agriculture</i>	J. T. MOON	Entebbe.	
<i>Assistant Director of Agriculture</i>	D. R. N. BROWN	Entebbe.	Proceeded on leave 15-10-55.
<i>Administrative Secretary</i>	E. B. BUCKINGHAM	Entebbe.	New appointment. Arrived 4-11-55.
<i>Establishment Officer</i>	A. S. BLEASDALE	Entebbe.	New appointment.
<i>Economic and Marketing Assistant</i>	T. BOOTHROYD	Entebbe.	New appointment.
<i>Office Superintendent</i>	LT.-COL. D. MACDONALD	Kawanda.	New appointment. (Special Development).
<i>Office Superintendent</i>	J. E. DE SOUZA	Kawanda.	
<i>Senior Accounts Officer</i>	J. F. R. LOBO	Entebbe.	Arrived 19-8-55.
<i>Personal Secretaries, Grade II</i>	MISS A. KING	Entebbe.	
	MISS D. M. G. BUNGE	Entebbe.	
	MISS L. M. E. L. McMAHON-WALL	Kawanda	Arrived 28-11-55.

B. General Division

Title	Name	Station	Remarks
<i>Assistant Director of Agriculture</i> (Special Development) ..	R. K. KERHAM, O.B.F.	Kawanda ..	Proceeded on leave 30-6 55 pending retirement.
<i>Chief Agricultural Development Officer ..</i>	A. D. LLEWELLYN-JONES	Kawanda ..	New appointment. Arrived 30-1 55.
<i>Assistant Directors of Agriculture (Field)</i>	D. F. STEWART ..	Jinja ..	Provincial Agricultural Officer, Eastern Province.
	MAJOR W. H. EDWARDS, M.C.	Kampala ..	Provincial Agricultural Officer, Buganda.
<i>Senior Agricultural Officers and</i> <i>Agricultural Officers ..</i>	G. D. BADGER ..	Gulu ..	Provincial Agricultural Officer, Northern Province.
	G. W. ANDERSON ..	Fort Portal ..	Provincial Agricultural Officer, Western Province.
	A. E. B. WILLIAMS ..	Jinja.	
	D. J. PARSONS, M.C.	Serere.	
	E. S. T. MARSHALL ..	Soroti.	
	D. C. TODD ..	Bukalasa.	
	R. G. HAMPSON, D.F.C.	Masaka.	
	I. R. LOW ..	Lira.	
	E. W. KING ..	Kabale.	
	D. INNES ..	Kawanda.	
	R. B. JOHNSTON ..	Mbarara.	
	R. J. HARVE ..	Fort Portal.	
	E. H. JONES ..	Entebbe.	
	A. G. OUSELEY-SMITH ..	Kampala.	
	A. R. DUNBAR ..	Moroto.	
	C. R. HORRELL ..	Serere.	
	W. HADLOW ..	Arua.	
	T. E. F. WEAVING ..	Gulu.	
	A. D. H. JOBLIN ..	Bukalasa.	
	R. E. H. ATKINSON ..	Kampala.	
	A. D. R. KER ..	Gulu.	
	A. R. HUMPHRYS ..	Masaka ..	Arrived 19-8 55.
	K. M. L. MATTHEWS ..	Fort Portal ..	Arrived 19-8 55.
	J. C. PHILLIPS ..	Jinja ..	Arrived 25-8 55.
	L. S. TODD ..	Soroti	Arrived 16-9 55.

Principal Field Officers

Senior Field Officers and Field Officers

J. F. Low ..	..	..	Serere.	On leave pending termination of contract.
L. B. Ellis ..	..	..	Kawanda.	
G. Oliver ..	..	..	Ngetta	
G. A. Fennell	..	..	Kabale.	
A. G. K. Will	..	..	Mbale	Seconded to Bugisu Coffee Scheme.
L. Green ..	..	..	Kawanda.	
J. G. Wilson	..	..	Moroto.	
J. L. McCumiskey	..	..	Bunya	Proceeded on leave 21-9-55.
A. E. Mussard	..	..	Kampala.	
W. P. Beattie	..	..	Mbale	Seconded to Bugisu Coffee Scheme.
J. G. Smithson	..	..	Kawanda.	
A. J. S. Armitage	..	..	Gulu.	
H. D. C. Tarlton	..	..	Hoima.	
D. C. Collin	..	..	Kabale	Arrived 24-8-55.
T. F. Ellis	..	..	Kabale	Arrived 9-12-55.
W. A. Kneale	..	..	Kabale	Arrived 19-12-55.
M. F. Merchant	..	..	Kabale	Arrived 13-10-55.
J. H. Miller	..	..	Kawanda	Arrived 26-10-55.
V. V. Millet	..	..	Ngetta	Arrived 31-7-55.
J. K. Mintowt-Czyz	..	..	Kampala	Arrived 12-9-55.
J. R. Morton	..	..	Kawanda	Arrived 28-9-55.
J. B. Mott	..	..	Fort Portal	Arrived 13-4-55.
P. W. Taylor	..	..	Bunya	Arrived 12-10-55.
J. Tilley ..	..	..	Lira	Arrived 21-9-55.
J. M. Trathen	..	..	Serere	Arrived 9-12-55.
N. R. E. Travers	..	..	Kawanda	Arrived 19-12-55.
J. H. Woodruffe	..	..	Kabale	Arrived 21-11-55.
G. J. Webb	..	..	Serere.	
T. R. Jones	..	..	Kawanda	

Mechanics

C. Laboratory Division

Title	Name	Station	Remarks
<i>Chief Research Officer</i>	J. D. JAMESON, O.B.E.	Kawanda.	
<i>Senior Entomologist and Entomologists</i>	A. P. G. MICHELMORE W. R. INGRAM P. E. S. WHALLEY	Kavanda .. Serere. Serere	Proceeded on leave 31-7-55. Arrived 16-9-55.
<i>Senior Chemist and Chemists</i>	Dr. E. M. CHENERY W. R. MILLS J. R. SIMPSON	Kawanda. Kawanda. Kawanda	Arrived 13 10- 55.
<i>Senior Botanist and Botanists</i>	J. F. ARCHIBALD W. HIRST B. J. T. BALDWIN I. LANGDALE-BROWN A. J. PRITCHARD	Kavanda .. Serere Kawanda. Kawanda. Kawanda	Arrived 20-9-55. Proceeded on leave 17-8-55.
<i>Curator</i>	C. SANDISON	Entebbe.	Arrived 19-8-55.
<i>Laboratory Technician</i>	E. W. HUGHES	Kawanda ..	Proceeded on leave 17-9-55.

D. Senior Assistant and Assistant Agricultural Officers

<i>Name</i>	<i>Station</i>	<i>Name</i>	<i>Station</i>	<i>Name</i>	<i>Station</i>
A. Kanya	..	J. M. Sekimpe	..	R. K. Kachope	..
H. R. Berunga	..	Y. E. Onaba	..	I. M. Bulikiro	..
Z. H. Kwebitha	..	G. F. K. Sagala	..	Z. K. Banagajja	..
Y. M. Kaidzi	..	O. L. Lalobo	..	A. G. Kibulo	..
P. Sempa	..	E. J. Kalanzi	..	J. N. Kimoima	..
G. L. Kigundu	..	Y. K. Musitwa	..	H. W. Muloki	..
P. M. Sali	..	E. D. Biruma	..	S. L. Takiramubudde	..
Y. K. Musisi	..	B. M. Kagolo	..	Z. N. Wanyama	..
H. D. Mubiru	..	B. Z. K. Kakoko	..	S. B. Kikule	..
Z. K. Kateraga	..	Y. B. Kizza	..	I. A. Wandera	..
S. M. B. Mutagwanya	..	Y. Yigga	..	S. K. Mukasa	..
E. B. Sarulo	..	J. K. Maviri	..	J. S. Musisi	..
A. K. Mulera	..	S. M. N. Kijambu	..	D. E. Kawalya	..
A. A. Kalanzi	..	E. Rwakaikara	..	J. S. Laker	..
F. H. O. M. Zake	..	J. M. Luzinda	..	F. J. Luswata	..
T. K. Otim	..	E. Kyagaba	..	P. F. Kunya	..
J. B. O. Baguma	..	I. G. Wanyoto	..	S. S. M. K. Sengendo	..
M. S. K. Makumbi	..	P. S. Bulera	..	E. B. Galukande	..
Z. K. Sekidde	..	J. C. Ssozi	..	N. O. Z. Sakio	..
H. G. N. Semambo	..	I. L. Lubwa	..	J. N. Byagagaire	..
				T. R. Odhiambo	..

II. Annual Report—Buganda Province

By W. H. EDWARDS, M.C. *Assistant Director of Agriculture (Field)*

A. GENERAL TOPICS

INTRODUCTION

43. To quote an old popular song, it can be cheerfully said that “there is an awful lot of coffee” in Buganda. In 1955, just over 120,000 tons of kiboko were harvested. This coffee brought an “awful lot” of money to the farmers; in fact, close on £13,500,000, and more than double the income received in 1954 from the same crop.

44. Cotton, in spite of the poor yields occasioned by dry weather of October and November, 1954, and the high incidence of diseases and pests, gave a very good cash return to the growers of close on £4,000,000.

45. The cash return to the farmers of nearly £17,500,000 from only coffee and cotton was an all-time record and was some £7,000,000 more than they received for the same crops in 1954. Indeed, it is more than probable that 1955 will go down in history as one of the most lucrative years for the coffee grower. Record yields coinciding with record high prices were the contributory lucky factors in this big draw.

46. In spite of all this money in the country, the Baganda farmers as usual responded magnificently to the campaign to plant more and plant earlier cotton. The acreage planted, in spite of adverse weather for most of June, was most satisfactory. Yields promise to be high and there is every assurance that growers again will reap handsome benefits from this crop early in 1956.

47. The entry of Africans into primary marketing and the processing side of coffee was a further step forward in the development of Buganda. Some 1,700 new coffee markets were gazetted during the year and, with very few exceptions, all went to Africans. Five new African coffee curing works were completed and five were in operation by the end of the year.

48. The campaign to save the soil, the wealth of Buganda, met only with limited success during the second half of the year. Progress in soil and water conservation has been most encouraging in the Province during the last few years. 1955, however, found the chiefs in difficulty when trying to encourage this vital and all-important work.

49. The appointment of a Minister for Natural Resources was a milestone in the constitutional history of Buganda. It is hoped that the Minister, as the spearhead of the various campaigns, will be influential in doubling progress in soil and water conservation, encouraging better attention to the grade of the main cash crops, and improving the lot of the farmer generally.

RAINFALL PATTERNS BUGANDA

STATIONS NORTH AND SOUTH OF THE EQUATOR

12

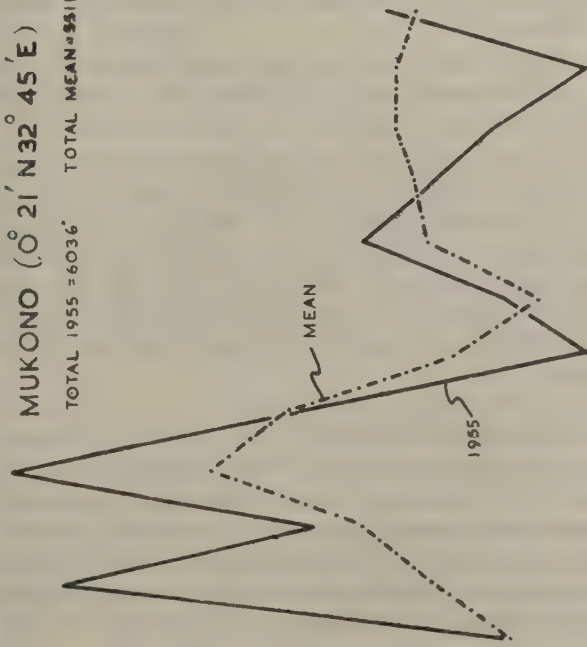
INCHES

MUKONO ($0^{\circ}21'N 32^{\circ}45'E$)

TOTAL 1955 = 60.36" TOTAL MEAN = 53.11"

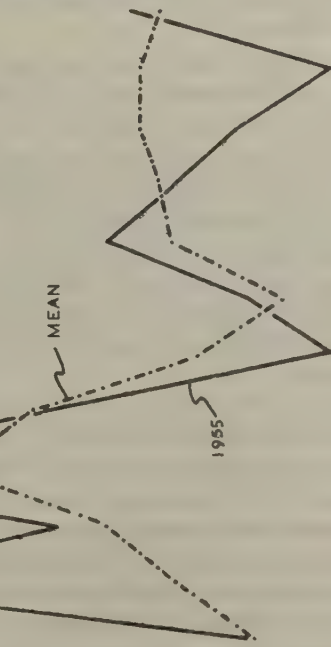
MASAKA ($0^{\circ}21'S 31^{\circ}44'E$)

TOTAL 1955 = 35.02" TOTAL MEAN = 42.64"



MEAN

1955



MEAN

1955

MONTHS

J F M A M J J A S O N D

50. The farmers in Buganda spent freely and wisely during the year. Many new permanent houses were built, others were re-conditioned and most grass roofs replaced by galvanised or aluminium sheets. Some spent their money on a pilgrimage to Mecca, while others bought good clothes, wireless sets, guns, not to mention bicycles, motorcycles and motor cars. As one Agricultural Officer from Kenya remarked when on a visit to Buganda, "the stream of traffic in new cars through Kenya to Buganda is never ending".

51. The year ended with a most successful Agricultural and Trade Show at Nakivubo. Although the show was a Protectorate-wide affair, most of the entries were from Buganda.

WEATHER

52. Intermittent heavy rains and rather dull conditions were experienced from the middle of January to the end of February in the northern half of Mengo and the whole of Mubende. In Masaka area and the southern half of Mengo, although February was overcast the rains were below average. After a bright sunny spell during the first three weeks of March, good rains fell everywhere, except for the Masaka area which remained dry.

53. The "Toggo" rains of April and May were about average throughout the Province. Unfortunately, however, the May rains cut out rather abruptly about the middle of the month, and a hot dry spell set in everywhere, to be broken only during the last few days of June when good rains fell in all areas.

54. The July rains were generally short and late, but August and September were reasonably wet in all areas. The good rains that fell from the end of July to the end of September made the cotton crop.

55. The "Ddumbi" rains of October and November were well below average everywhere. The long hot and dry intervals experienced during this time had a desiccating effect on the cotton in many areas. The yield, however, did not appear to suffer unduly, although some boll shedding was reported from some areas. Whether or not the lint suffered remains to be observed. The first twelve days of December were unusually hot and dry, but later heavy rains fell everywhere and these continued to the end of the year.

SOIL AND WATER CONSERVATION

56. The progress in soil and water conservation which has been so apparent in the last few years in Buganda was unfortunately not generally maintained during 1955. Although a fair amount of soil and water conservation work is normally done during the "Toggo" rains, the main drive comes after the plantings of the food crops and the cotton crop or on the onset of the "Ddumbi" rains.

57. Although the Department working through the *saza*, *gombolola* and *miruka* councils initiate these campaigns to save the soil and the rain in the "*bibanja*", the spearhead of the attack is undoubtedly the

chiefs. During the first part of the year much of the chiefs' time had to be given to the assessment and collection of graduated tax with the result that they were not in the field to lead these campaigns. In spite of this, however, progress was maintained during this period.

58. The landslide, however, came during the second half of the year. The majority of the chiefs were preoccupied with various celebrations, while others found themselves in difficulty when trying to encourage any progressive work. In spite of this, however, some managed to maintain and improve on the work in their areas; this was especially true of most of Bulemezi, one or two gombololas in Kyagwe and Buyaga.

59. In parts of Masaka where good work had been done earlier some people took advantage of the political situation to destroy many of the bunds. Not satisfied with this, they even went as far as to destroy Buganda Government property and the property of the chiefs who encouraged the work.

AGRICULTURAL EDUCATION

60. During the year the attendance at the various courses held at the Bukalasa Farm Training Centre was as follows:—

3rd year learners	..	..	..	4
2nd year learners	..	..	..	8
Apprentices	..	..	..	19
School teachers	..	..	..	32
Community Development Assistants			..	19
Chiefs (at Nsamizi)	..	..	..	18
Chiefs and cultivators	..	..	..	226
Total				326

61. Although the intake of apprentices was 19, four of the students failed to make the grade at the end of the first term examination and were sent home. By and large, however, the standard of the students appears to be improving. In view of the raising of Bukalasa Training Centre to the status of a farm institute no apprentices will be accepted for training in 1956. The farm institute will be ready to accept students for training early in 1957

62. The attendance of chiefs and cultivators showed a sharp decline from 373 in 1954 to only 226 in 1955. This drop in attendance was most marked from August onwards; no doubt this was due to their preoccupation with the various celebrations that took place at that time. These chiefs and cultivators' courses are undoubtedly doing good and appear to be popular. The livestock side of the farming system is of particular interest to the majority on the courses. One often hears the remark that so and so has improved his holding since his visit to Bukalasa.

63. Two Assistant Agricultural Officers left for a 12 months' course of training at Houghall, Durham, in September. They had been awarded a Protectorate Government and a Buganda Government scholarship

respectively. The wife of one of the officers is also attending a domestic science course at Newcastle. Three Assistant Agricultural Officers now serving in the Province have already successfully attended this course.

AGRICULTURAL PROGRESS AND EXTENSION

64. A very extensive and intensive campaign to plant cotton earlier was organised throughout the Province from April onwards. Some 20,000 cotton leaflets in Luganda and 500 in English produced by the Department were distributed during this period. The chiefs and the farmers responded admirably to the plea, "plant early and plant more," but unfortunately the dry spell from mid-May to practically the end of June spoiled the chances of getting a record acreage planted in June. The very fact that the campaign succeeded in spite of the elements and more especially in spite of the fact that most farmers had already had much ready money on hand from a bumper coffee crop was most encouraging.

65. The Buddu Show held in June was hailed as a great success and many thousands attended the opening days. The show was run conjointly with a chiefs' and leaders' course and lasted a week. The show, unfortunately, however, had a distracting influence on those attending the course. At this show, held under the auspices of the Community Development Department, the Agriculture Department had a stand and a large demonstration plot. Draught oxen from Kamenyamigo Farm were also present to demonstrate ploughing and transport. Lectures to the course were given by the specialists and senior members of the Department.

66. An educational week held at Buyaga, Mubende, during August was an unqualified success. The course was very well attended and many lectures on various agricultural subjects were given during the week. In addition, a large demonstration plot of various crops and a tobacco curing barn were available for the practical side of the lectures. The week ended with a very fine show. A similar very successful educational week for selected leaders was held at Mwera, Busujju, in October, and will no doubt go a long way to assist extension work in that area in future.

67. Two miruka chiefs' courses were organised by the Community Development Officer at Nakifuma and Ngogwe, Kyagwe, during the end of August and early September. Two days out of the four-day course were given to lectures on various agricultural topics, and to visits to see soil conservation work in the areas, and to see good farms in the neighbourhood. The courses were undoubtedly a marked success and will greatly help the chiefs in their extension work in future years.

68. A local show held at Ngando, Butambala, during October proved a successful venture. It was well attended and the standard of the produce and livestock most satisfactory for such a small area. As usual the Department had a large demonstration plot and a stand at the show.

69. The Young Farmers' Club at Namutamba, Mityana, put on their own show in October and are to be congratulated for their initiative and success in such an admirable venture.

70. The Agricultural and Trade Show held at Nakivubo in December was hailed as an unqualified success. It was the effort of many. Although the show was open to the whole of Uganda, the majority of the produce and livestock exhibits only naturally, because of its proximity to the place, came from Buganda. The departmental stand displayed the work of the various sections, such as agronomy, chemistry, entomology, botany, animal and crop husbandry and general extension work. The show was attended by many thousands from all over the Protectorate and lasted four days.

71. Agricultural progress and extension work are complementary and inseparable. The success of extension work can only be judged by agricultural progress in the various areas. It is difficult to define a yardstick by which to judge such progress, although increased production of such crops as coffee and cotton and general improvement in the standard of living are no doubt good indicators, this is not all. Increased production can be achieved at the expense of the soil, and without due care to husbandry methods. Our extension work, therefore, must be directed mainly to increasing production through better attention and care of the soil and more attention to proven simple good husbandry practices.

72. In Buganda, it has been found that annual inter-gombolola and inter-county competitions are a good barometer by which to judge such progress. Targets were set for such competitions early in the year and covered all aspects of sound agriculture, such as:—

Soil and water conservation in all its aspects, manuring, mulching, composting, practice of rotations and grazing of resting strips, selection of good planting materials such as disease-resistant varieties, early planting and proper spacing of cotton, proper maintenance of “ensuku” and other food crops, pruning and weeding of coffee, proper picking and drying of coffee and cotton and other export crops with a view to improving grade and quality, general hygiene of the farms, and so on.

73. The competitions are a team effort, since much of the work is done on a communal basis, “bulungi bwansi”. The winning gombolola or county is rewarded with a shield and the outstanding members of the team are given prizes. A few selected members of the second best gombolola or county are also given prizes. The whole gombolola benefits by a feast, money for which is provided by the Buganda Government and the Department. These annual agricultural competitions have done more to encourage better agriculture than anything else in the province. Shield and prize presentation days are the greatest yearly events in the competing saza. The shields and prizes are always presented by ministers of either the Protectorate or Buganda Governments or by other leading members of the community.

74. The judging of the competitions is normally done at the end of each year by senior members of the agricultural community of Namulonge, Entebbe and Kawanda. Judging of agricultural progress in 1955 for various reasons will not take place until early in 1956.

75. The publication of a magazine, *Onward*, for farmers in Buganda was started, but unfortunately, owing to lack of clerical assistance during the latter half of the year, the second edition has not yet been finalised. 2,000 Luganda copies and 500 English copies of the first edition were issued from this Department. The magazine contained simple articles by a number of experts and was well received.

PESTS AND DISEASES

76. The incidence of blackarm on cotton was very slight compared with 1954. This was in the main due to the fact that only dressed cotton seed was used throughout the Province. In 1954, when Singo and Mubende counties were issued with undressed seed, the blackarm count was about 65; this year it was only six. Kyagwe County, although issued with dressed seed in both 1954 and 1955, showed a drop in the blackarm count from 19 in 1954 to nine in 1955. Four cotton seed dressing stations operated during the year, being located at Kasenye, Kalule, Kireka and Mpigi.

77. Mosaic disease of cassava continued to be in evidence in areas where much "matooke" was available. This crop is only eaten when other crops are in very short supply. As this position, however, is hardly ever encountered the turnover of the crop is consequently very slow and the older trees tend to get diseased. Over the last four years, however, much progress has been made in the distribution of resistant varieties and in areas where cassava is eaten the crop is remarkably free from the disease.

78. A mealy/bug fungus complex *Planococcus*/*Polyporus*, possibly symbiotic on roots of coffee, has been recorded in about a dozen cases from Busiro county. The mealy bugs, attended by ants, appear on the roots; later, the bugs become enveloped in a mycelium which excludes the ants. About this stage, the tree takes on a sickly appearance and by the time the fungus throws out a grey fluted fructification the tree is invariably dead. The trees affected by this complex in all cases were of a type when the lower branches swept downwards to reach the ground, giving a heavy shade effect.

79. The old perennial, the banana weevil, *Cosmopolites sordidus*, continued to depress yields, although this was only apparent in the badly maintained "ensuku". The weevils during the latter half of the year had a lucky break—there was little weevil "hand picking" this year compared with 1954.

80. Small swarms of the desert locust, *Schistocerca gregaria*, were observed over Bulemezi, North Singo and Mubende during early December. No damage was reported from any of these areas.

81. The coffee berry borer, *Stephanoderes hampei*, became very prevalent during the latter half of the year, and much damage to beans was reported by officers of the Coffee Industry Board. Many berries were left on the trees and many more on the ground during the early part of the year, as growers found difficulty in picking such a heavy coffee crop. Under such ideal conditions the pest multiplied rapidly.

EXPERIMENT STATIONS

82. The experimental side of the Bukalasa Farm was handed over to the Research Division, Kawanda, on the 1st July. The remainder of the farm comprising the livestock section, the plantain garden, paddocks and other plots will house the new farm institute. Planning of the new farm layout and farming system for the institute is well ahead and should be well established by 1956.

83. Early planted cotton on newly opened land in Bukalasa is turning out to be the most profitable crop for the farm. Yields from the 1955 cotton crop are likely to be heavy. Although yields from the 1954 crop were somewhat low due to adverse weather and much disease, they do demonstrate quite clearly the advantages of early planting. Late June planted cotton yielded an average of 750 pounds of seed cotton per acre, while late July cotton yielded on the average only 283 pounds of seed cotton. The district variety trial planted on the farm in early June averaged 1,587 pounds of seed cotton per acre.

84. No experiments were done on Kamenyamigo Farm, Masaka, but the farm continued to expand the cultivation of both annual and perennial crops. The coffee acreage has been increased to 20, while the annual crops occupy some 11 acres. There are over 50 acres of improved pastures on the farm for grazing 51 head of cattle. All the draught for the farm is done by oxen; some of the oxen are also hired out for ox ploughing, notably in the ex-soldiers' settlement area in Bukango.

85. The farm is serving to train oxen for the area and very notably acts as a good demonstration of a large mixed farm. All the manure produced is used on the plantain garden of some four acres and on the coffee. In addition, coffee husks ex curing works are being used extensively on the coffee in order to encourage others to follow suit. Although only six acres of old coffee are in bearing, the revenue from this is about thrice as much as from other sources. In order to encourage and demonstrate the value of May planted cotton in the district, some 10 acres were interplanted in the young coffee; this cotton shows every promise of being a high revenue yielder.

86. Kakumiro Farm, Mubende, serves as a valuable demonstration farm for strip cropping, proper rotations with special reference to tobacco in the farming system, and proper maintenance of other crops such as plantains and coffee. It produces tobacco and coffee seedlings for the neighbourhood, and in addition it houses the district cotton variety trial plots. All the tobacco seed for the Mubende tobacco industry is grown on the farm. A plot of tea seed bearers supplies the demand for estate tea planting locally. The farm is now being developed as a mixed farming unit for encouraging local farmers to follow suit.

87. Namyoya Farm in North Kyagwe covering some 18 acres carries a cotton variety trial and nitrogen/phosphate cotton fertiliser trial experiment. In addition, it serves as a useful centre in the area to demonstrate strip cropping, rotations and progressive farming generally. It also serves

as a centre for bulking up good seed of various annual crops, production of coffee seedlings, mosaic resistant cassava cuttings, and as a museum of local famine crops and the best local plantain varieties. In 1956 it is the intention to purchase a few cattle for integration into the present farming system.

88. The plot of selected strains of Nganda coffee at the Mukono variety trial centre continued to supply seed for the numerous coffee nurseries in south and east Mengo. The centre also produces coffee seedlings and resistant cassava cuttings for most of the south Kyagwe area. A new banana variety observation plot was established at the end of the year, and certain fertiliser trials with coffee and plantains will probably be tried out in 1956. It is the intention to raise this centre into a mixed farming unit in 1956.

89. In addition to the cotton variety trials mentioned, a further seven are scattered throughout the province. Most of these in addition serve as cassava increase centres for mosaic resistant strains. Nkozi cotton variety trial centre also runs a nitrogen/phosphate fertiliser trial similar to that in Namyoya. "Lunyu" tolerance observation plots are also maintained at Vumba and Buwunga, Masaka area.

90. The Department, on behalf of the Buganda Government, maintains some 42 coffee nurseries throughout the province. Many of these coffee nursery centres are also mosaic resistant cassava increase plots. Incidentally, most of the money for maintaining Namyoya Farm, Kyagwe, is voted by the Buganda Government.

ANIMAL HUSBANDRY AND PASTURE WORK

91. At the end of the year there were 50 head of cattle at Bukalasa Farm, of which 23 were cows and heifers. Some nine cows were in milk throughout the year. The balance being 15 bulls and bullocks and 11 bull and heifer calves.

92. The policy of once daily milking was continued. The cows were grazed either inside the electric fence on the leys or on the hillside pastures adjacent to the labour lines. Cows were fed on cassava at milking time, and water was freely available at the kraal. The increase in total milk production during the year compared with 1954 was some 61%, while the increase in average daily individual yields was 26%.

93. This outstanding increase is probably mainly due to improved grazing management. Very careful attention has been paid to rotational grazing of the leys and the permanent pastures to provide a greater measure of worm control. The electric fence has forced the cattle to graze roughage as well as young grass during the rains. Coffee husks have also been available to the cows when housed in the shippon during the midday period. It is thought this type of management has had a balancing effect on the ration during the rains. Generally, milk production during the rains tends to fall sharply; this year, however, the drop was only slight and the recovery after the rains much more rapid.

94. The "Bukalasa" skin disease, which caused so much concern last year, has turned out to be not as serious as was feared. The bull and the cow which died from a serious attack of this disease were, in fact, found, after post-mortem, to be suffering from a variety of other more serious complaints, including tuberculosis. It appears, therefore, that the disease is only serious when the animal is already in very poor health.

95. The flock of sheep at the farm has continued to do badly. Attempts to improve the stock by buying locally have been most disappointing. In the words of the officer in charge, "They have not justified their existence". Attempts to weed the "lusuku" with the sheep in moveable pens were not entirely fruitful since the sheep learned to climb out only too easily. Improvement in the small herd of pigs was maintained by importation of new blood. The herd is allowed to range freely in the "lusuku" with good effect, and no ill effect to the plantain garden.

96. The policy of producing work-oxen in conjunction with a small milking herd continued at Kamenyamigo Farm, Masaka. At the end of the year the farm had a herd of 51 cattle, out of which 26 were oxen and eight cows, the balance being made of two bulls and calves of both sexes.

97. The herd is grazed on the 50-acre leys established on the farm and on the farm's permanent pastures. All stock receive supplementary food off the farm in the form of sweet potatoes, roots and tops, maize, beans, cut elephant grass and added minerals. The herd, in consequence, has been maintained in good health: deaths due to tuberculosis, liver fluke and East Coast fever were less than six per cent during the year. The kraal manure made on the farm has been used entirely on the "lusuku" and coffee. Milk production has only recently started and may be a good revenue earner for the farm.

98. The oxen, which are used for both draught and ploughing, completed some 12,330 hours' work on the farm during the twelve months under review. Another six oxen have been attached to Bukango Ex-Soldiers' Settlement since August on contract ploughing. It is yet too early to say how this oxen hire scheme will work out.

99. The flock of sheep on this farm, unlike Bukalasa, has proved to be a very successful proposition, and has maintained a high lambing rate throughout the year. The "Baanabuddu" have shown great interest in both the sheep and the cattle on the farm and the demand for rams, ewes and bulls for breeding has been most encouraging.

100. A small herd of polled cattle has now been firmly established at Kakumiro Farm, Mubende. The farm was recently honoured by the visit of His Excellency the Governor, and His Excellency remarked most favourably on the high quality of the bull and the cows. The herd consists of one bull and six cows; five of the cows have recently calved down. The herd is grazed on the *Chloris gayana* resting strips and the fenced paddocks adjoining the kraal. The grazing here consists mainly of *Brachiaria decumbens*. In addition, the herd is fed on sweet potato roots and tops, cassava and other crops off the farm.

101. The milch cows will be milked once daily in the early morning; for the rest of the day the calves will be freely ranged with the dams. Milking has only recently started, but careful records will be kept for selecting for breeding and for culling.

102. All the farmyard manure produced on the farm is used on the demonstration "lusuku", and when more is available this will be used on the newly established coffee plot. The farm serves as a very useful demonstration of a mixed farm unit in the district and already other farmers with cattle in the area are following suit. Very little improvement in pasture management has been evident in this district. Although plenty of Rhodes grass seed is available off the farm, local demand has been nil; the demand for *Chloris gayana* seed in other areas of the province is also negligible.

103. Good work has been done with the establishment of leys at Kamenyamigo Farm during the year. *Chloris gayana* and *Melinis minutiflora* undersown with "bulo" proved a more effective way of establishing a pasture than just direct sowing of the former mixture. The finger millet was grazed in the young state, and the later take of good grasses was most satisfactory. *Digitaria scalarum* was less serious by this method than with direct sowing of the mixture. This ley carried a beast to the acre.

104. Mowing of pastures as opposed to grazing has shown to be more advantageous in maintaining and improving the growth of the good grasses. Rotational controlled grazing by means of an electric fence might, however, prove to be more superior, and next year this system will be adopted for comparison. It is interesting to note that at Kamenyamigo, *Brachiaria decumbens*, when once established, has a smothering effect on *Digitaria scalarum* and even appears to kill this weed, as no live rhizomes were found under the *Brachiaria* on digging, although previously the area had been solid with the weed.

105. Communal grazing areas especially on hillsides in many areas are being rapidly encroached by *Cymbopogon afronardus*—over-grazing and over-burning are no doubt contributory to this. The poor ground offered by this grass results in much erosion and scarring of the hillsides, a sight all too common these days in many areas.

106. Digging out of "tete" as a simple way of encouraging the better grasses to take over continued to be advocated: this and paddocking of the improved areas continued to be practised in the Ngogwe area by many cattle owners. The use of cattle as transporters of nutrients from the swamps and communal grazing areas was widely practised by cattle owners in the intensive farming areas. The manure produced as a result is being used more and more on coffee and plantains with spectacular results.

107. Ox-ploughing has made a small start in Buruli county; some seven acres were ploughed on the initiative of a small group of farmers who were trained at Serere in 1954.

108. The Special Development Section last July bought 10 oxen from Lango for the encouragement of ox-ploughing and ox-draught in

the Galiraya area of north Bugerere. These oxen are now under training at Galiraya under the direction of expert ploughmen from Serere Experimental Farm. If the scheme is successful and if the local farmers are keen, it is the intention to sell the oxen to those requiring them for contract hire work in the area. The Department is making more money available for further training of oxen for both draught and ploughing in these two counties as well as Masaka.

109. Animal husbandry during the year for one Agricultural Officer has varied from the orthodox to paring a donkey's toe nails and rescuing fair damsels from the wrath of swarming bees. One sting only was painfully recorded in the latter operation.

IRRIGATION AND SWAMP RECLAMATION

110. North Bugerere and the southern part of Lake Wamala, the only two areas considered suitable for irrigation projects in Buganda, were surveyed by Sir Alexander Gibb and Partners during the year. It appears, however, extremely doubtful if the water in Lake Wamala is sufficient to carry out any large scale irrigation project. A scheme in north Bugerere would only be economical when sufficient cheap electrical power is available at night to operate the pumps from the Nile to inland reservoirs.

LIAISON AND CO-OPERATION WITH THE BUGANDA GOVERNMENT AND WITH OTHER DEPARTMENTS

111. The closest liaison was maintained with the Ministers at Mengo through the Agricultural Adviser, and at the saza, gombolola and miruka levels through the Agricultural Officers, Assistant Agricultural Officers, Agricultural Instructors and Assistant Agricultural Instructors. The Ministers, the Agricultural Adviser and the chiefs have given the fullest co-operation to any campaigns which have been instituted for developing agriculture in the province. Indeed, without their fullest co-operation and help extension work on a wide basis could not be attempted.

112. In September a Minister of Natural Resources was appointed for the first time in the history of Buganda. The closest touch was maintained with the Minister during the latter part of the year, but as much of the Minister's time was taken up with political affairs there was little opportunity to do joint safaris.

113. The Community Development Officers in the province have given very useful assistance in arranging educational weeks and agricultural shows throughout, thus relieving the field staff to get on with the technical side of the extension work. The Information Department has given every assistance to all our requests for publicity.

114. District staff conferences in the two Mengo districts operated for a short time during the first part of the year, but were brought to a close when the new constitutional changes in Buganda came into effect. Numerous joint safaris were done by Agricultural Officers with members of the Administration, Veterinary, Forestry and other Departments.

NON-AFRICAN AGRICULTURE

115. Most of the many coffee estates in the province picked a very heavy crop during the early part of the year, and no doubt coffee proved most profitable. Falling prices soon after this bumper harvest have had a stimulating effect on better husbandry in most estates and greater care and attention is now being paid to weeding, pruning and use of fertilisers with a view to offsetting the fall in price by increasing the yields.

116. The year was generally favourable for sugar cultivation and the production at Lugazi was 27,139 tons, which was some 6,627 tons more than in 1954. Again, good progress in better husbandry and use of fertilisers is much in evidence at this estate.

117. Interest in tea planting continued and many more acres were planted on estates in all the three districts of Mubende, Masaka and Mengo.

B. FOOD CROPS

PLANTAINS

118. Green plantains, the staple food of Buganda, were in plentiful supply throughout the year. Local shortages near dry lake shore areas in Masaka and Mawokota started the usual talk of "enjala" (famine).

119. The acreage shows an increase on 1954; this figure covers eating as well as brewing plantains. A conservative estimate using low yields shows that at least 5,000,000 tons of all varieties are produced in the province. This will give over 20 lb. per day of "matooke" per head of population for both eating and for beer.

120. This indicates that the plantain acreage even with present maintenance and standards, which are not satisfactory, is much too high. More intensive cultivation of plantain gardens would enable most growers to reduce their present areas of "matooke" considerably without endangering the internal food supply. The land so released could be beneficially used for other crops, or for grazing the odd cow near the house for milk to supplement their diet.

GROUNDNUTS

121. The acreage planted was high. Although some of this crop is sold for export, a very high percentage is retained for eating.

BEANS

122. Enough beans were available throughout for both local consumption and for local sale. Only a very small tonnage of this crop was exported.

SWEET POTATOES

123. Although the acreage planted shows a drop on 1954, sufficient of this food was available everywhere throughout Buganda.

CASSAVA

124. Every taxpayer according to local bye-laws should plant a quarter acre of this root crop. This bye-law is seldom enforced by the chiefs as the crop is seldom eaten except in the drier areas and in the larger townships by immigrant labour. Supplies were more than sufficient to meet the demand.

YAMS

125. The growing of yams and other yam types is very much on the increase, especially in Mengo. The growing of these crops has been a target in the annual agricultural competitions for the last four years and no doubt this has stimulated much interest in the crops.

C. ECONOMIC CROPS

COTTON—1954/55 SEASON

126. The dry conditions which were experienced during October and November of 1954, coupled with the high incidence of blackarm and other pests, severely affected the yield of the 1954/55 cotton crop which was only 99,078 bales compared with 136,442 bales in the previous season.

127. Growers received an all-time record price of 61 cents per lb. for "safi" and 23 cents per lb. for "fifi". The cash return to growers in Buganda from the sale of the 1954/55 crop was £3,870,364, being some £600,000 less than from the previous season.

128. The marketing of the crop proceeded smoothly but rather slowly. Heavy rains and dull conditions during January and February interfered with both picking and drying. Marketing was further delayed by the fact that many growers were simultaneously harvesting and drying a record coffee crop, which on account of its very high price only naturally took priority. The dry sunny spell early in March helped the ripening of the late crop in south-west counties with the result that much cotton moved north out of this area. In previous years the movement has been in the reverse direction.

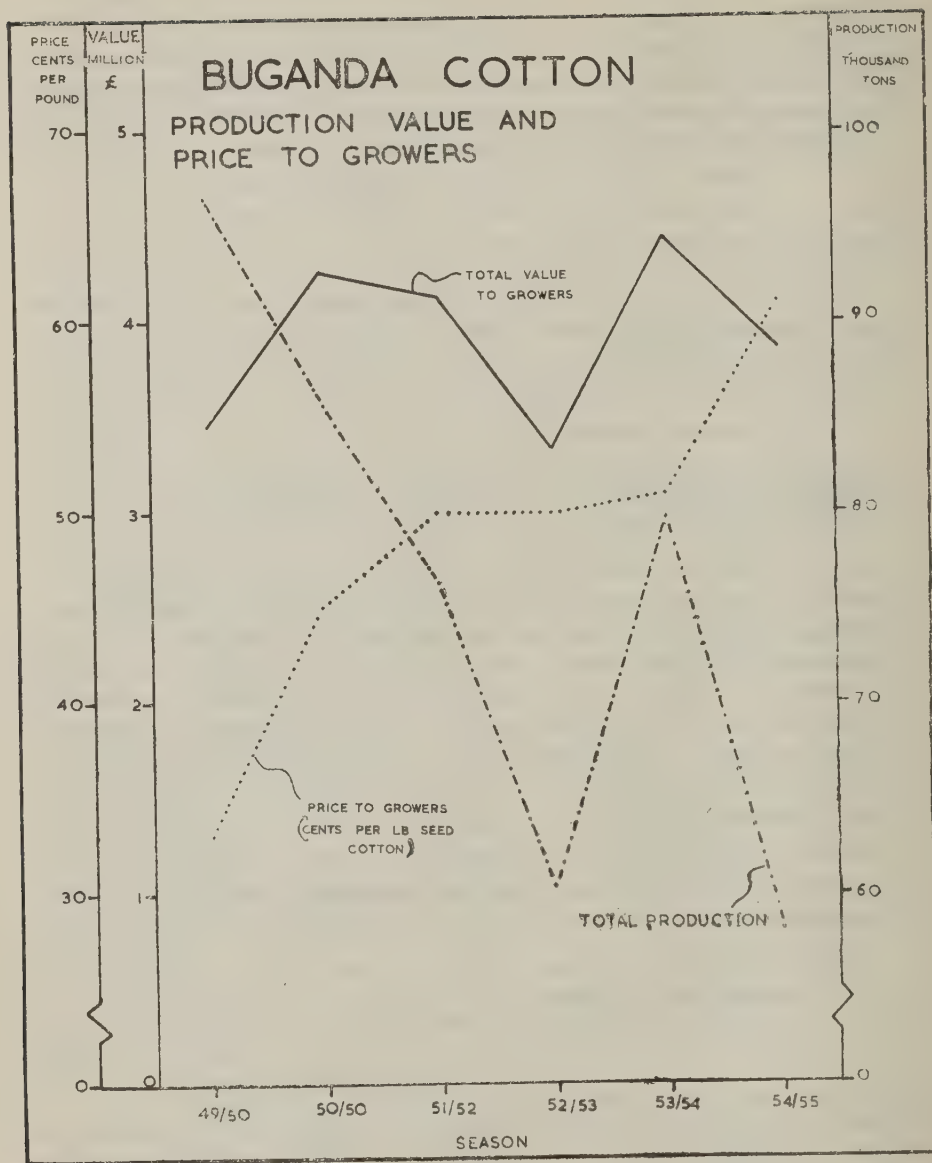
129. In spite of the inclement weather at harvesting and drying, the grade offered for sale was reasonably satisfactory. The grade, however, was often marred by the presence of plantain fibre, "ebhayi".

130. Detailed purchases and yields of seed cotton by zones for the 1954/55 season were as follows:—

Zone	Total	Bales equivalent	Yield per acre
	<i>Tons</i>		<i>lb.</i>
Mengo-Entebbe ..	46,367	79,196	312
Singo-Mubende ..	7,953	13,583	276
Masaka ..	3,688	6,299	241
Provincial Totals and Yields ..	58,008	99,078	301

COTTON—1955/56 SEASON

131. Intensive propaganda was made throughout the province from April onwards in an endeavour to get the cotton crop planted early and to increase the acreage in areas where this was feasible.



132. The campaign was most successful and growers were all keyed up to plant most of their cotton in June; the elements, however, intervened and early planting received a severe check from the dry spell which lasted from mid-May to nearly the end of June. Fortunately, good rains fell during the last few days of June and much cotton was planted then, especially in Bulemezi, north and south Kyagwe and Bugerere counties. Good planting weather, however, in the southern parts of the province

was late, resulting in much of the cotton in the Old Entebbe and Masaka areas being later planted than usual.

133. The acreage planted was 373,582 and showed a substantial drop on previous seasons.

134. Dressed cotton seed was planted in all zones of the province. In the Masaka zone, Mengo-Entebbe zone and most of Singo the variety planted was B.P.52, while in Mubende and the rest of Singo the variety planted was B.P.52/6.

135. Details of acreages by zones are as below:—

Zones		1955/56 season	1954/55 season
		<i>Acrès</i>	<i>Acrès</i>
Mengo ..	..	290,045	333,176
Masaka ..	..	33,162	34,283
Mubende ..	..	50,375	64,483
TOTAL ..	..	373,582	431,942

136. The good rains received from the end of July to the end of September made the crop. The incidence of pests and diseases was much lower than in previous years, and there is every promise that the crop will yield well. The rather abnormal hot and dry conditions experienced during most of October and November did not affect the yield adversely, although some boll shedding was reported from some isolated areas.

137. The estimate at the end of the year was as under:—

Zone		Bales	
Mengo-Entebbe ..	..	110,000	±5,000
Masaka ..	..	9,000	±2,000
Singo-Mubende ..	..	14,000	±2,000
TOTAL ..	..	133,000	±9,000

COFFEE

138. An all-time record tonnage of 60,160 of clean coffee was inspected for export during 1955. This is some 25,000 tons more than was produced during the previous record of 1951.

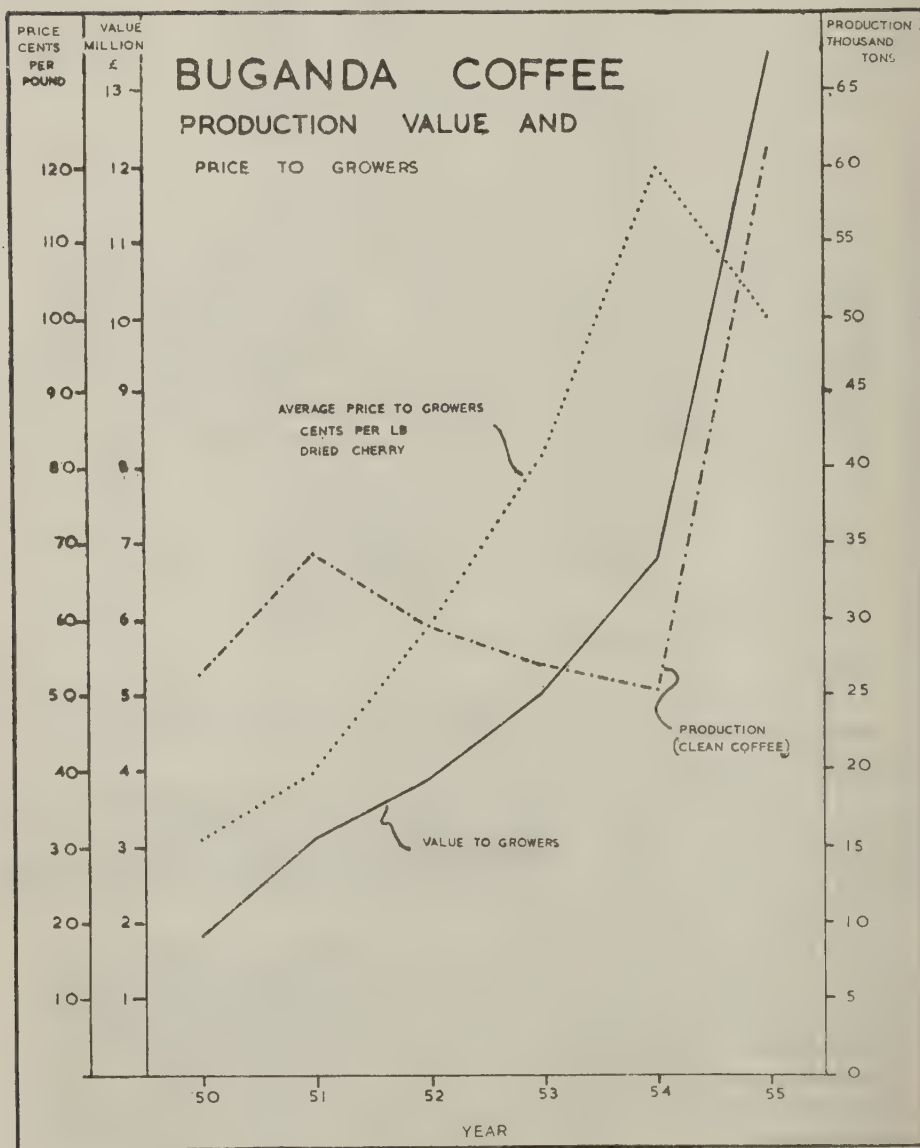
139. More than half of this record amount was bought from the growers during the early months of the year when the price stood at Shs. 1/25 per lb. kiboko at scheduled hulleries and licenced curing works. The price dropped to 75 cents per lb. on the 16th May but remained at this figure for the rest of the year.

140. Coffee growers, as a result of this lucky combination of high prices and record yields, received approximately £13,500,000 in cash from the sale of the crop. This is more than double what they received in 1954. Primary buyers received in addition some £340,000 for their share in the primary marketing of the crop.

141. Actual quantities of clean coffee in tons inspected are as follows:—

	Totals 1955	Compara- tive Totals 1954
	<i>tons</i>	<i>tons</i>
Mengo	39,349*	17,340*
Masaka	20,811	7,856
TOTAL	60,160	25,196

*includes Mubende.



142. Out of a total of six new African curing works permitted under the Coffee Bill, five were completed and were actually operating by the end of the year. These were located at Bombo, Mityana, Mpigi, Kalisizo and Kyabakusa. The sixth at Kawempe has not yet been built, but there is every hope that it will operate sometime in 1956.

143. The new centres were gazetted in 1955 and the number of primary markets permitted increased from 400 in 1954 to 2,142 in 1955. With very few exceptions, all these new centres and stores went to Africans. With a crop expectation of 40,000 tons of clean coffee, this means that a coffee primary buyer can only expect to make on the average a gross profit of about £100 per annum. As the transport element is high, the net profit will be very small indeed and it is likely that a number of stores will eventually be eliminated.

144. The heavy rains and overcast conditions during most of January and February greatly handicapped the proper drying of the heavy crop harvested during those months. Drying facilities were inadequate as most of the growers had never experienced such heavy yields before. The constant fear of theft at night made it necessary to pack the coffee in "debbes" or heap it in the houses every evening. This constant heaping of the wet and semi-wet cherry caused it to heat and ferment under improper conditions and no doubt lowered the grade of the final product.

145. The use of trays for drying is taking on and much encouragement is being given to the use of these by the chiefs and the Department's field staff. The saza workshops in some counties are making trays for demonstration and sale for about Shs. 20 a tray.

146. As a result of the high returns received from the crop, the standard of cultivation of coffee throughout the province has been maintained at a satisfactory level. "Lumbugu" is still a pest and no doubt has a very depressing effect on coffee yields in many plots. Mulching with both grass and coffee husks is being practised with advantage in the Masaka area and mulching only in Mubende as no coffee husks are available in that district. The use of coffee husks and cotton seed husks is also increasing in the Mengo District. Coffee husks are now more easily available to many growers in Mengo from the three new curing works established away from Kampala. Kraal manure, where available, is being used freely with spectacular results.

147. The high returns received from coffee have stimulated further plantings and no doubt a fair acreage was again planted during the year. Approximately 500,000 seedlings were distributed and stolen from coffee nurseries during the year; at the recommended spacing these would only represent an increase of some 2,500 acres. This, however, is only a fraction of the increase since many growers have their own small nurseries, while others collect seedlings from forests and large estates, so it is extremely difficult even to hazard a guess at the actual acreage planted.

148. Good flowering took place throughout most of the province during early November and again in mid-December. Conditions at the time were favourable and a good crop appears to have set. Coffee growers can look forward to a fair crop in 1956.

GROUNDNUTS

149. No recorded sales figure is at present available, but it is anticipated that this will not be much higher than 1954. Most of this crop is planted in the first rains, as the second rains crop does not do as well. The spring rain plantings showed promise of yielding well, but the dry spell from mid-May to the end of June affected the later crop adversely, so yields were not too satisfactory. Export of this crop from Buganda is never high as most of the crop is consumed locally.

TOBACCO

150. The crop is confined to Mubende District and a very small area in west Mengo. In 1955 as a result of higher prices the production of fire and air-cured leaf increased by some 50% compared with 1954. The number of tobacco growers went up by nearly 1,000 to 4,714 compared with the same period. The mean acreage per taxpayer, however, remained relatively low and was only 0.27.

151. The early tobacco plantings were established under favourable conditions and made good progress and yielded well. The late plantings suffered adversely from the long dry spell during June and yielded rather poorly. Losses from hail were on the whole rather severe.

152. The grade was generally good in spite of adverse weather at picking and curing. Due to wet conditions at marketing in November, however, the moisture content of the leaf was generally higher than in 1954.

153. Production statistics are tabulated below:—

	Grade I	Grade II	Total 1955	Total 1954	Cash to Growers	
					1955	1954
	lb.	lb.	lb.	lb.	£	£
Fire-cured ..	345,425	113,889	459,314	298,252	21,257	11,099
Air-cured ..	140,121	41,898	182,019	128,432	8,473	4,844
GRAND TOTALS	485,546	155,787	641,333	426,684	29,730	15,943

MAIZE

154. On account of the low prices received for maize in 1954 little interest was displayed in the crop during 1955 and the acreage planted in Mengo dropped sharply from 172,000 acres in 1954 to 101,276 in 1955. Much of this crop was early planted and yields were generally good.

155. In view of the short crop the price kept high and farmers received on the average 15 cents per lb. An estimated marketable surplus of 280,000 bags was sold in the province, giving a cash return to growers of approximately £400,000. Contrary to rumours and in spite of the good price, very little maize was planted in the second rains.

CASTOR SEED

156. Picking was on a limited scale only. More interest was shown in the crop towards the end of the year when the price hardened. No figure is available at present for Mengo and Masaka, but Mubende exported about 300 tons.

SOYA BEANS

157. Mengo only, recorded any planting of the crop. The acreage was 2,042 but export figures are not yet available.

III. Annual Report—Eastern Province

By D. F. STEWART, *Assistant Director of Agriculture (Field)*

A. GENERAL TOPICS

INTRODUCTION

158. The unusual pattern of rainfall made the year a perplexing one for cultivators. Early-planted food crops yielded poorly but large acreages of root crops and better yields from late-season crops restored the position and no general food shortage is expected in 1956. Inclement weather was the cause of low yields from a record cotton acreage but prices were higher than ever before. Although the price of arabica coffee had fallen from the 1954 level, production was nearly 50% more than the previous record. The general level of prices for agricultural produce continued to be high and cultivators enjoyed a prosperous year. This was particularly so in Bugisu District, where co-operative societies received a total of over £2,000,000 from the sale of their arabica coffee crop. One manifestation of this acquisition of wealth was a conspicuous improvement in the standard of housing.

WEATHER

159. There was no general deficiency in total rainfall but its distribution was most erratic. The early rains were late in arriving and of short duration, and the mid-season dry spell was severe. November was exceptionally dry and unseasonable and heavy rains fell in December. Rain was deficient at vital stages in crop growth with the result that the yields of early food crops and of cotton were poor, particularly in the areas with lighter soils. Perennial crops and root crops on the other hand were favoured by the rain at the close of the year and flourished with unaccustomed vigour.

SOIL AND WATER CONSERVATION

160. The use of uncultivated grass strips between cultivated plots to prevent erosion continued to be encouraged as standard policy in all areas. In Teso District, which outstrips all others in erosion control, plots and stop-wash strips were realigned to base contours, and cattle tracks and paths which were sources of erosion were protected with bunds. There was slow and generally unspectacular progress in other districts, but a distinct advance was noticeable in Busoga District where two years ago stop-wash strips between plots were a rarity. Bare-earth drying floors in house compounds were surrounded by planted grass and good work was done in Bukedi District in the demonstration miruka in grassing roads with *Paspalum*. The use of this efficient soil-binding

grass is making some headway against unreasoning opposition. In order to maintain soil fertility cultivators are advised to rest their land for three years after an equal term of cropping, but all have not enough land to permit half to lie fallow, and other means to restore soil fertility must be sought. It is evident from a study of the statistics of land use that the land is being subjected to heavy and increasing pressure from an expanding population and its domestic animals, which in some areas, particularly in the plains of Bugisu and Bukedi and parts of Teso District, is already greater than the land can sustain indefinitely under present systems of usage. Ameliorative measures are being initiated in the over-worked areas of Ngora and Kumi counties of Teso District, including planning farms for more efficient land use and application of stock manure by "mucking" and also by means of moveable cattle kraals and night paddocking. Resettlement of the population is also being encouraged with the objective of giving the time and opportunity to insist on improved farming methods in the reception areas, and at the same time to rehabilitate the evacuated ones. Such measures are likely to prove no more than palliatives to the basic problem which is that the land is over-full with families engaged in subsistence farming and keeping livestock. African local councils continued to control grazing as necessary, and a grass burning policy was formulated by district teams. In broad terms this advocated early burning in forest reserves and their immediate vicinity; early rotational burning where there was no danger of bush encroachment, having regard to the local soil conservation policy and timed according to the condition of the vegetation and the grazing requirements each year; and, lastly, a late and therefore fierce burn where there was the menace of bush encroachment.

161. Water supplies continued to play a most important role in agricultural development. Fifty new boreholes were sunk in 1955, and six new dams were constructed. At the end of the year the number of boreholes and dams in the individual districts of the Province were as follows:—

District		No. of boreholes	No. of dams and tanks	
Bugisu	..	33	2	(1 incomplete)
Bukedi	..	103	9	(5 incomplete)
Busoga	..	252	16	
Teso	..	328	87	
TOTAL ..		716	114	

AGRICULTURAL EDUCATION

162. A site for the main Farm Institute for the short grass areas was chosen at Arapai in Teso District, the District Council willingly allocating 500 acres for it. A grid survey was done and a successful valley dam was constructed. Boreholes were sunk repeatedly without locating the additional water required, but it was decided to proceed

with the establishment of the institute on an assurance that piped water would be available from the Soroti supply. A local sub-committee formulated comprehensive proposals for the capital expenditure, lay-out, organisation and cropping of the Farm Institute, and it is hoped to open up the farm land and to start work on the buildings early in 1956. Arrangements were made to establish a District Farm School at Amuria in Teso District, but in Busoga District the problem of selecting a site for such a school remained unsolved. A total of 357 persons attended courses at the Serere Agricultural Education Centre. The courses provided included two years' training for learners seeking entry to the departmental establishment, a week's elementary agriculture for chiefs and cultivators, and agricultural instruction for chiefs and their wives attending a course of one month's general administration. Visits to Serere were also made by school parties and members of Young Farmers' Clubs. For the first time junior field staff of the Department were given refresher courses in their own districts by the Agricultural Officers and by the Coffee Officer in Bugisu, instead of being sent to Serere Education Centre. This innovation was successful in that it created mutual understanding and appreciation amongst the staff, and also gave the junior members of it better equipment and more confidence to shoulder their very real responsibilities. A close integration of the work of the departmental staff in the Province was also brought about by the second Annual Agricultural Officers' Conference in March and by the Provincial Consultative Council meeting in September.

AGRICULTURAL PROGRESS AND EXTENSION

163. Agricultural progress resulting from extension work is a gradual evolution, and cannot readily be assessed or measured by comparing one year with another. It brings to mind the short, apt entry by a Provincial Commissioner in a County Tour Book in 1937, which read "gave the clock another wind". All means and opportunities offering were taken to bring agricultural advice to the mass of cultivators. During the year a District Agricultural Show and four sub-county shows were held in Teso District. Two county shows were held in each of Bukedi and Busoga Districts and one in Bugisu District. Competitions for agricultural betterment between small communities (mitalla) and for school gardens were held in all four districts. Coloured hand-bills, issued in thousands, on subjects of current agricultural interest, newsletters to chiefs, circulars, films, visits to see progressive individuals and areas, and demonstrations of innovations at prison farms and in selected areas, all played their part in assisting the spread of agricultural knowledge, which is a necessary precursor to farming improvement. Special attention was given to certain selected progressive farmers in the heavily populated parts of Teso District, and to a lesser extent in Bukedi District. If even a few such pioneers can be seen to win a worthwhile increase in income from better farming, then many of their fellows will wish to imitate their example, and they will provide a potent incentive to progress. Farm planning or efficient use of land has been, and is, an urgent need in all

areas and a start was made in Teso District in 1952. At their own request the land of individuals and groups of cultivators was marked out into blocks to permit an orderly cropping sequence and improved farm organisation. Some interchange of land was necessary in making these demarcations. Up to the end of 1955 approximately 1,943 acres had been demarcated for 48 families in five counties in Teso District, and a similar service was provided on a smaller scale for farmers in Bukedi District in connection with Credit Bank loans for agricultural development. There was a decline in demand from farmers for mechanical cultivation from both the contracting centres, Serere in Teso District and Busoga Farms in Busoga District. In Teso the number of acres mechanically cultivated decreased from 551 in 1951 to 118 in 1955. The Government sponsored contract schemes, as such, were abandoned from lack of interest on the part of cultivators, but it is proposed assistance will still be given to any worthwhile large projects which may be initiated by the farmers themselves. Tractors and ploughs were operated at many prison farms and there were four privately-owned tractors in Bugisu, one in Teso ploughing 23 acres, and two in Bukedi ploughing some 300 acres.

164. In all districts progress was made in the distribution of varieties of cassava resistant to the mosaic disease virus. In Teso District, in which the replacement of susceptible varieties was completed some years ago, work was confined to roguing when the disease appeared.

165. Co-operative societies and unions are potentially fruitful means for the dissemination of information about improvements in agricultural practice but, unfortunately, the movement in Uganda is as yet pre-occupied with marketing and processing interests to the exclusion of the problems of production. It is, nevertheless, intended to persevere with this important line of approach. Young Farmers' Clubs and Community Development Clubs for both men and women also form nuclei of persons with a common interest in agricultural betterment, which is well worth cultivating.

166. The Uganda Credit and Savings Bank and the African Loans Fund provide facilities for genuine progressive farmers to acquire capital on loan for agricultural development. The Agricultural Department was represented on the Allocation Committee of the Loans Fund.

PESTS AND DISEASES

167. Swarms of the desert locust, some of them large, made their appearance mainly in the north of the Province towards the end of the year but no serious damage was done.

168. With the inclusion of Busoga District in the programme for the first time, all cotton seed for planting in the Province was treated with fungicidal dust against blackarm disease. The following records of the percentages of plants suffering from stem lesions due to blackarm clearly illustrate the way in which the seed treatment reduces primary infection.

Zone			1950	1951	1952	1953	1954	1955
Segregated Area	..	..	15*	6*	2*	3*	4*	3*
Usuku and North Teso	..	..	37	8*	8*	5*	7*	5*
South Teso	..	..	21	10*	5*	5*	7*	2*
South Mbale	..	..	—	47	7*	8*	10*	15*
North Mbale	..	..	42	40	31	15*	14*	9*
Busoga	..	..	—	—	23	42	53	8*

* dressed seed.

169. In 1955 the weather in the latter part of the year was particularly favourable to the spread of blackarm disease and in spite of the reduction in primary infection substantial damage resulted from secondary epidemic.

170. *Lygus* continued to take a heavy toll of the cotton crop, particularly in Teso District and the Budama area. Busoga District was remarkably free from the pest and Bugisu District was also little affected.

171. The ravages of *Helopeltis* on cotton were locally severe, mainly in Busoga District. Cotton wilt appeared to be increasing but did not reach serious proportions. Bacterial rotting of cotton bolls which caused substantial damage in the 1954/55 season was even more prevalent in 1955/56 because of the very wet weather during the harvesting period.

172. Arabica coffee in Bugisu was dusted against *Antestia* with pyrethrum for the second successive year. The dusting was successful in restricting the numbers of this bug and in increasing production. In 1954, 890 acres of coffee belonging to 1,750 growers received a first application of pyrethrum dust, and 149 acres belonging to 397 growers were given a second application. In 1955, 3,103 acres received a first application, and 388 a second one, the owners numbering 5,492 and 489 respectively. The costs of application were worked out at Shs. 33 for a dosage of 15 lb. and Shs. 22 for 10 lb. per acre.

173. The arabica coffee lace bug *Habroch'la placida* continued to spread and became a potential menace. A survey of its distribution was begun and should be completed early in 1956.

174. The incidence of coffee leaf rust, *Hemeleia vastatrix*, was lower than had been expected. The favourable weather in December 1954 and January 1955 appeared to have counteracted the weakening effects of the previous heavy crop. Even so, the disease took toll of coffee which was unthrifty because of neglect or because of its marginal habitat.

175. The root mealy bug on coffee, which was first seen in 1954, was located in isolated plots throughout the coffee areas. It was expected that depredations of the coffee berry borer *Stephanoderes hampei* would be severe during the 1955/56 crop because of the large quantity of dried cherry ('buni') sold. In the event, infestation was not high, suggesting that the control measure customarily advocated of destroying unsold 'buni' was proving effective.

176. In spite of dissemination of advice on how to control the coffee stem borer *Bixadus*, this pest was again troublesome near the forest line, and more often than not the curative treatment of cutting the

coffee stems had to be applied. Cutworms in coffee nurseries were destroyed with 0.5% B.H.C. powder. Thrips were less damaging to coffee than during the previous season.

177. The importance of mosaic disease of cassava diminished as the planting of resistant varieties became more widespread. Cassava scale, which was severe last year, was found only in isolated places in all districts, and the ban on large-scale movements of cuttings for planting was lifted.

178. Stem borer in cereals caused a serious but unknown loss of potential crop.

179. Panama disease of bananas was found in Bugisu District last year, and has since been identified a number of times. African opinion is that it has been present for many years and that it does not materially impair production. Banana weevils continued to be fairly widespread in Busoga and Bugisu Districts.

EXPERIMENT STATIONS

180. Plans for the development of an otherwise suitable site, for the new Arabica Coffee Research Station in central Bugisu, had to be postponed pending investigation by the Medical Entomologist into the possibility of destroying the fly *Simulium neavei* which was found to be infesting the area. The preliminary examination of this problem is to begin early in 1956.

181. A large scale field trial was made jointly by the botanical and entomology sections, together with the Coffee Officer, on some 14 acres of coffee around the Bulucheke circular road. Plots were selected in groups and half in each group were sprayed twice with 3 lb. of Perenox in 100 gallons of water, once in February and once in May, and the other half were left untreated as a control. The results were inconclusive but were not discouraging, and the trials will be continued.

182. Trial was made of sowing coffee seed at stake at monthly intervals in the co-operative societies' nurseries. The germination was variable but low, possibly owing to lack of sufficient care, and the trials will be repeated under closer control. It is clear that the existing method of raising seedlings by transplanting should remain unchanged for the present. Seed for planting was collected by the Coffee Officer from outstanding mother trees selected in the field. A living collection of procumbent leguminous cover crops was started at Bugusege Experiment Station.

183. A small pilot field scheme involving spraying cotton against *Lygus* was conducted under the supervision of the entomological section on the boundary of Teso and Bukedi Districts, including part of both. It seemed likely that the spraying would give little advantage in yield in the circumstances of this trial, which were an unavoidably late-planted

crop and unseasonably plentiful rain in December and January. Cotton and coffee variety trials and fertiliser trials were continued and well maintained.

ANIMAL HUSBANDRY AND PASTURE WORK

184. Paddocks were fenced and controlled grazing was started at some prison farms. *Chloris gayana* was sown on the resting plots at cotton variety trial centres, sometimes using the last cultivated crop as a nurse crop. A few progressive farmers erected fencing for better management of grazing.

IRRIGATION AND SWAMP RECLAMATION

185. Irrigation for vegetables was continued on a very limited scale in the hills of Bugisu District. A contracting firm performed a survey of irrigation possibilities from the hills to the plains in the north of Bugisu District, and also examined the potentialities for swamp utilisation in all districts.

RESETTLEMENT

186. During 1955 a start was made in the north Amuria county settlement scheme in Teso District to convert the haphazard land use of early settlers into organised settlement on a village basis with planned siting of houses and orderly arrangement of cultivated and resting land in blocks. The size of the family block was 24 acres and at the end of 1955 some 3,924 acres had been reorganised at three centres of a total of 135 families. Over-stocking was a menace and one of the most important and delicate problems was to restrict the number of cattle to the carrying capacity of the land, as otherwise there would be a repetition of the excessive pressure on the land which was a feature of those parts of Teso District whence the settlers came. The Amuria Resettlement Scheme is at present on a purely voluntary basis without regulation but it is clear that unless the necessary adjustments can be made by negotiation and consent some form of simple control will become essential.

187. The Busoga Farms Resettlement Scheme, planned towards the end of 1954, did not prosper for a variety of reasons. The causes of the failure are being investigated, and an administrative officer was posted to the area to examine the position and to try to gain the confidence of prospective settlers. Elsewhere, particularly along the east bank of the Nile, opened up since the eradication of the "Mbwa" fly (*Simulium damnosum*), and on the fringes of the sleeping sickness areas in south Busoga and in Bukedi Districts unorganised resettlement is taking place, and will continue to do so until an acceptable form of land tenure is agreed. Very important proposals by Government for modifications to customary systems of land tenure are under study by the African Local Government councils.

LIAISON WITH LOCAL GOVERNMENT AND OTHER DEPARTMENTS

188. The provincial and district team system with regular monthly meetings, which is operative throughout the Eastern Province, is such that co-operation between departments and the African Local Government is close and friendly at the highest level. All districts also have county teams which on the whole, do useful work, often including arrangements for county shows. A move is afoot to extend this close co-operation to the sub-county level, where embryo teams already exist. This close liaison is all-important, as it becomes clearer every year that the district advisory staff of the Agricultural Department must have the support of the chiefs if agricultural progress is to advance. African Local Government bye-laws or resolutions, used judiciously as a means of information and propaganda, as much as to empower enforcement, played their part in helping to further the cause of agricultural betterment. It is hoped that the chiefs will come, with experience, to appreciate the objectives of their own legislation and to apply their bye-laws independently without impulsion from the staff of the Agricultural Department.

189. The importance which co-operative societies are assuming in the disposal of agricultural produce is illustrated by the following figures:—

District	Number of registered Co-operative Societies		Approximate tonnage of produce handled in 1955
	1955	1954	
Bugisu	102	98	97 % of the arabica coffee—6,328 tons including 'buni' and 322 tons of cotton.
Bukedi	191	178	3,771 tons of cotton.
Teso	53	42	754 tons of cotton and 16 tons of other produce.
Busoga	145	141	3,119 tons of cotton and 520 tons of groundnuts.

190. Whilst the Forestry Department continued to supply seed and to give technical advice, a part of its extension services became a function of the Agricultural Department. The number of nurseries was increased considerably, and the demand for tree seedlings from cultivators was good.

NON-AFRICAN AGRICULTURE

191. Non-African agriculture is largely concentrated in Busoga District, where the most important estate is the Madhvaninagar Sugar Estate, which produced 380,164 bags (each of 224 lb. net) of sugar in 1955 as compared with 203,001 bags in the previous year. In addition there are two coffee estates in Busoga District, one of which was given temporary permission to process African grown coffee in the absence of a licensed scheduled hullery or licensed curing works in the district.

B. FOOD CROPS

192. Planting conditions during the early rains were precarious and with a dry June yields were low. Cultivators, on the whole, responded well to campaigns later in the year to make good this deficiency and any minor shortages in early 1956 are expected to be made good locally.

ELEUSINE (FINGER) MILLET

193. The total acreage planted in the province was 712,755, which was only some 12,000 acres less than last year's figure. Acreages were greater than last year's except in Busoga District where there was a shortfall of over 40,000 acres. Yields everywhere were poor to fair.

PLANTAINS

194. As a result of the wet December in 1954 and good total rainfall during 1955, plantain gardens became healthier and more fruitful. Yields were good but prices nevertheless remained high. In Bugisu District plantains now constitute a cash crop of considerable magnitude, being sold in the Bugisu plains, in Bukedi, Teso and parts of Busoga Districts.

BEANS

195. The total acreage planted remained much the same as last year's at 79,432. There was a small increase in Busoga District and a large increase in Bukedi District, but in Bugisu District the acreage dropped by approximately 20,000 or 50%.

COW PEAS

196. In Teso District, where the crop is popular, plantings increased from approximately 70,000 to 93,000 acres.

CASSAVA

197. The total acreage in the Province fell from approximately 251,000 to 202,000 acres, which was considered satisfactory in view of the fact that there was little opportunity to plant until the second rains. In Teso and Bukedi Districts, where the crop is most important as a famine reserve, the acreages were fortunately very similar to those of last year.

SWEET POTATOES

198. There was no shortage of planting material, and the deficiency in cassava was made good by increased plantings of sweet potatoes, which in the whole province rose from 186,000 to 204,000 acres. The expansion of sweet potato acreage was particularly noticeable in Busoga District where the cassava shortage was the most evident.

C. ECONOMIC CROPS

COTTON—1954/55 SEASON

199. The dry June which delayed planting, the dry November which arrested growth and development at a critical time, combined with a fairly severe *Lygus* attack and wet conditions at harvest resulted in production falling far short of the expectations from the record acreage planted. Only 79,785 tons of seed cotton, equal to 137,490 bales, were marketed as compared with 110,128 tons, or 187,489 bales, the previous season, despite an increase in acreage of over 90,000. The crop was the lowest since 1950. Details of sales for the past four years, in bales, are:—

Zone	1954/55	1953/54	1952/53	1951/52
Busoga	63,844	94,104	79,248	78,109
North Mbale	22,625	35,728	29,844	35,135
South Mbale	23,028	32,271	21,622	26,224
Usuku	3,905	2,825	4,560	2,337
North Teso	9,503	6,720	9,201	9,483
South Teso	8,640	8,664	8,710	8,774
Teso Segregated Area ..	5,903	7,177	7,608	8,759
ZONAL TOTALS ..	137,490	187,489	160,853	168,821

The seed rate at planting was still too high, being 21 lb. per acre in the Teso zone, 23 lb. in the Busoga and Mbale zones and 29 lb. in the Usuku zone. Yields per acre were disappointingly low, averaging only 203 lb. of seed cotton, the highest being Busoga zone with 232 lb. and the lowest north Mbale zone with only 153 lb. Prices paid were the highest on record, being Shs. 60 per 100 lb. of good raw cotton and Shs. 23 per 100 lb. of stained raw cotton. The total value of the crop to growers in the Eastern Province cotton zones was £5,345,214 compared with £6,193,351 the previous season. The figures given for the Eastern Province zones exclude Kaberamaido county of Teso District which is within the Lango zone. After a bad start, when extremely poor grade cotton was offered for sale, marketing went smoothly and without congestion.

COTTON—1955/56 SEASON

200. During the year the north and south Mbale zones were amalgamated into one zone designated the Mbale zone. Total plantings in the Eastern Province zones amounted to 845,356 acres, the crop being some 43,000 acres less than in the previous season, and much about the same size as in the 1953/54 season. There were reductions in acreage in all zones except the Mbale zone. The crop was generally late because of adverse weather early in the planting season. Only 69% was planted before the end of July, compared with 77% two years ago. The variety planted throughout was S.47 except in the first and second Teso Segregated areas where pedigree seed of the new wilt resistant variety S.47/DE715 was multiplied.

201. Germination was patchy particularly in the areas of lighter soil and some replanting had to be done. Normal growth of the crop took place from July to October but there was a long dry spell in November followed by abnormal and heavy rains in December, and in January and the first half of February, in 1956.

202. Marketing started in the Teso zones and in the north of Mbale zone on the 12th December, 1955, in the south of Mbale zone on the 3rd January, 1956, and in Busoga zone on the 4th January, 1956. The prices were reduced to Shs. 54 per 100 lb. for good raw cotton, and Shs. 20 per 100 lb. for stained raw cotton. Harvesting and marketing were done under extremely difficult weather conditions, but considerable pre-season propaganda had been carried out and the grade of cotton sold was reasonably good in the circumstances.

COFFEE—ARABICA COFFEE 1954/55 SEASON

203. The Bugisu Co-operative Union was responsible for the coffee nurseries and in May to June 1955, 18,234 growers bought 1,003,653 seedlings at six cents each, making an average of 55 seedlings per grower. The actual cost of producing the seedlings was 12 cents each, and the difference between cost and selling price was met by the Bugisu Co-operative Union. In addition, 22,860 seedlings were issued free under the replacement scheme, bringing the grand total of seedlings issued to 1,026,510. A ticket system proposed by the Coffee Officer for controlling and recording seedlings issued was rejected in all areas except Sebei where it was welcomed by growers as being quick and efficient. The nurseries also supplied 12,536 *Cordia* tree seedlings for shade.

204. The rate of survival of seedlings issued was 80% compared with 85% in the previous year. Neglect was responsible for much of the mortality of seedlings but dry weather after planting also contributed. Pruning was organised by the primary co-operative societies under the technical control and guidance of the Coffee Officer and his staff. Care was taken to avoid the tendency to overprune, which had been apparent formerly, and on the whole results were satisfactory. The total cost of pruning was £16,223 or an average of Shs. 22 per acre of bearing coffee, which was calculated at the end of 1955 to be 14,724 acres.

205. A record crop was marketed, being nearly 50% above the previous largest which was in the 1939/40 season. Marketing was for the first time in the hands of the Bugisu Co-operative Union, and inexperience combined with insufficient care resulted in a decline in efficiency and grade. Altogether 6,170 tons of parchment were marketed, of which 97% was native prepared parchment and 3% was bought as cherry and prepared at the co-operative union pulping stations. Of the total crop 53% was from north Bugisu, 33% from south Bugisu, 8% from central Bugisu and 6% from Sebei. In addition to the parchment, 7 tons of lights and 489 tons of dried cherry ('buni') were marketed and a further

14 tons of clean ungraded coffee were sold locally. 9% of the crop was sold as dried cherry ('buni') as compared with 5% last year. The average yield per acre was 8.4 cwt. of parchment, plus 0.7 cwt. of other types. The prices paid to growers per lb. of coffee were—cherry 54 cents, 'safi' parchment Shs. 2/86, 'fifi' parchment Shs. 2/19, and 'buni' 76 cents. An average quality bonus of 4.7 cents per lb. for all parchment sold was earned by the societies which retained a levy of varying amounts to cover expenses, improvements and various other items. These prices included an element of subsidy of 30 cents per lb. of parchment which was paid out from the Price Assistance Fund of the Bugisu Coffee Board.

206. Average prices per cwt. at the Nairobi auctions on an f.o.r. basis at Mbale and losses in milling were as follows:—

	Price	Loss in milling
	<i>Shs.</i>	<i>%</i>
Union prepared parchment ..	366.14	17.9
Native prepared parchment ('safi')	342.63	19.2
Native prepared parchment ('fifi' and 'lights')	288.91	25.0
'Buni'	102.32	50.3

207. The corresponding price for native prepared parchment ('safi') last year was Shs. 461/67 per cwt., indicating a drop in price of £121 per ton. Sixty-nine co-operative societies bought 97% of the total crop as compared with 86% last year, and they received 84.5% of the total sale value of the crop, after deducting export tax 8%, Union expenses 7.2%, and Bugisu Coffee Board cess 0.3%.

COFFEE—ARABICA COFFEE—1955/56 SEASON

208. In 1955, for the first time seed was selected by the coffee staff from the best plots in each primary co-operative society's area. Either Kents or Bugisu local variety was selected according to the wishes of the members. This selected seed was for the first time planted in each of the 69 primary society's nurseries in amounts approved by the Coffee Officer. The Agricultural Department formerly supervised central nurseries and subsequently the co-operative union maintained semi-centralised society nurseries and finally the primary societies have established their own nurseries under the technical control and guidance of the Coffee Officer. The nurseries of the primary societies were generally well maintained although there were some cases of neglect. Continuity of coffee staff resulted in an improvement in cultural methods, such as pruning, cultivation and de-suckering, although more assistance could have been given by the executive committees of both the union and the primary societies.

209. The amount of coffee bagged at the co-operative union drying centres by the end of December 1955 was 2,587 tons of parchment which was nearly 1,000 tons more than for the same period last year, which indicated a welcome improvement in the efficiency of the union

in collecting and handling the crop. There was also a substantial improvement in the grade. The estimated crop for the 1955/56 season is 4,200 tons of parchment.

COFFEE—ROBUSTA COFFEE

210. For the past two or three years robusta coffee growing in Busoga has become more popular and the African Local Government nurseries were unable to meet the demand for seedlings in 1955. Many thousands of seedlings were imported from Buganda and sold. Growers were advised to plant a limited number of well maintained trees near their homesteads under shade rather than to establish large plots which were likely to be neglected. Purchases of dried cherry (kiboko) over the past four years have been:—

		<i>tons</i>
1952	..	45
1953	..	30
1954	..	72
1955	..	299

The price of robusta kiboko was Shs. 1/25 per lb. during the first part of the year but dropped to 75 cents per lb. on the 16th May, at which level it remained for the rest of the year. In Bukedi District four nurseries were planted in order to issue robusta seedlings for trial on a limited scale.

MAIZE

211. The acreage of maize planted increased in Busoga District from 46,000 to 91,000 but decreased in Bukedi District from 35,000 to 18,000 and in Bugisu District from 49,000 to 32,000. The acreage in Teso District remained much the same at 6,000 acres. The provincial maize acreage increased from 138,000 to 148,000 acres. Most of the maize was planted at 6'×1' spacing, and interplanted with groundnuts or beans according to the advice of the Agricultural Department. In Busoga District some 50,000 bags of 200 lb. each were delivered to the Grain Conditioning Plant at Jinja, and it is estimated that total sales amounted to some 100,000 bags, the average price being 14 cents per lb. Yields were very low.

GROUNDNUTS

212. The total acreage of groundnuts planted in the province increased from 173,000 to 230,000. The greatest amount was planted in Teso District, closely followed by Busoga District. In Busoga District the acreage increased from 43,000 to 78,000 and in Bukedi District from 37,000 to 52,000. In all districts except Busoga most of the crop is eaten and not sold, but in Busoga it is estimated that an equivalent of 12,000 tons of shelled nuts were marketed. The price per lb. of unshelled nuts paid to growers was 20 cents per lb.

SHEA BUTTER NUTS

213. 1,187 tons were collected and sold in Teso District.

SIMSIM

214. This crop is popular only in Teso District, where the acreage planted remained at the customary level of 23,000 acres, from which only 110 tons were sold, the rest being eaten by the cultivators.

SUNN-HEMP

215. This crop was introduced into Teso District as a cash crop last year, and the acreage expanded from 136 to 650, and sales from three to 17 tons. The price to growers was 50 cents per lb.

IV. Annual Report—Western Province

By G. W. ANDERSON, *Provincial Agricultural Officer*

A. GENERAL TOPICS

INTRODUCTION

216. The expected mid-season dry spell set in much earlier than usual this year and by early May rainfall had virtually ceased in all districts. Crops which had been planted at the onset of the unusually early rains in January and February developed satisfactorily and the harvest from these was reasonably good but crops planted from mid-March onwards suffered severely in the later stages of growth and all were well below normal while some failed completely. As a result, local shortages of some foodstuffs occurred in certain areas. Luckily none of the shortages were unduly serious and adequate cover was afforded by the use of alternative foods from neighbouring sources.

217. In Kigezi, peas and English potatoes were in short supply for much of the year. Other foods were available in reasonable quantity.

218. The Ankole crops were generally satisfactory although the late planted millet and beans yielded but little. In certain limited areas, in consequence, millet was in short supply from October until the harvest of the autumn crops eased the situation. Bananas suffered a serious setback in the dry weather and reduced production was becoming noticeable towards the end of the year.

219. Early crops of maize in Toro were reasonably good but the later plantings in Mwenge and Busongora failed almost entirely. Supplies were adequate for local needs but did not suffice to meet the demands of commercial enterprise as well and the various concerns which normally buy locally had to be advised to make other arrangements. Other foodstuffs were available in quantity and no difficulties were experienced.

220. The only shortage of any consequence which occurred in Bunyoro was of sweet potatoes. Most of the crop was planted late and a large proportion of it failed. Maize was also a partial failure, but as the crop is not of major importance in the district as a whole, there were no serious consequences.

WEATHER

221. The anticipated pattern of conditions in the province of a dry spell early in the year, rain from March until early June, a mid-season dry spell in late June and July, rain again from August until November followed by a gradual tailing off in the rainfall to the end of the year, did not materialise.

222. Conditions were somewhat abnormal in all districts and although the total falls were adequate, distribution was erratic.

223. In Kigezi it was wet from January to early May and at intervals throughout this period exceptionally heavy storms accompanied by high winds were experienced. Hail storms also occurred periodically, particularly in February. The dry spell was prolonged, lasting from early in May until late July and in the northern parts of the district, hot, burning winds were common in May and June. From early August until towards the end of November conditions were very wet indeed with a repetition of violent storms.

224. Conditions similar to those in Kigezi were experienced in Toro during the early months with the difference that hailstorms were more frequent and spread over a longer period. Rain failed in most parts of the district at the end of the first week of May and the dry spell that followed, although interrupted by heavy storms in the Kasese area at the end of May, was severe particularly over the greater portion of Busongora county. After some intermittent showers in July, steady and well distributed rainfall was experienced until towards the end of November. A short dry spell of about two weeks lasted until mid-December and this was followed in the western areas by another wet period which continued until the end of the year.

225. In January in Ankole, rainfall was widespread but not particularly heavy. From early February until mid-April however, rainfall was plentiful over the whole district with peak intensities occurring in March when some extremely violent storms accompanied by high winds and hail did a fair amount of damage. During the latter half of April rains were light but widespread, followed in early May by heavy rain over the whole district except the sazas of Nyabushozi, Ishingiro and Kajara. Dry conditions prevailed from the last week in May until mid-July after which rainfall steadily increased to a second peak of considerable violence in September. One particularly severe hailstorm in south Ruampara at the end of that month wrecked a large acreage of crops. From September until the end of the year rainfall was widespread, generally as heavy storms.

226. Of the four districts, Bunyoro had the most peculiar weather. Other than some heavy storms in late January and a few scattered showers in March, no widespread rainfall was experienced until the first two weeks in April. At the beginning and end of May and again at the beginning and end of June good rains fell while the intervening periods were hot and dry. It was not until July that really satisfactory falls occurred, and for the next three months were considerably above average for the district except in the lake shore and escarpment areas. Late in October the rains eased off somewhat, although heavy falls were common until well on in November. Sporadic heavy storms were experienced in December.

SOIL AND WATER CONSERVATION

227. It is unfortunate that the majority of the peasant farmers, although placing such importance upon the possession of land, should do so little of their own accord to protect it from damage by water, fire and general misuse. When at the same time, the efforts of departmental staff to promote good conservation practices are frequently nullified by suspicions that the techniques advocated are not in fact designed to achieve the objects stated but have some ulterior motive, it is hardly surprising that conservation work usually progresses disappointingly slowly.

228. Even when by concentrated efforts, large areas have been successfully protected by bunds of grass strips, there remains the continual menace of the "chiselling" away of the strips or bunds from the downhill side during subsequent cultivations. This is perhaps one of the most urgent problems to be tackled and it is particularly serious in hilly country where because of the topography, the bunds are spaced at comparatively close intervals.

229. As far as the general application of bunding and grass stripping is concerned, Kigezi District still takes pride of place and it is so rare as to be remarkable, to see any cultivated land without some form of protection. The maintenance of existing protective strips is however, none too good and the "chiseller" is a very real danger in the land. So much so that in many cases the line of what remains of the bunds is so far off contour as to render them useless as protective measures. The long-advocated alternate strip cropping method of land use is still practised over the greater part of the district but with the ever increasing pressure of population and the consequent need to make optimum use of the resources of land available, this somewhat wasteful practice is gradually giving way in all suitable areas to block cultivation. Progress to date has not been spectacular but headway is being made.

230. The standard strip width of from 12 to 16 yards (measured uphill) is being maintained and as additional protection, work is being directed towards the laying down of lines of crop stover halfway between the bunds. Under the conditions of low rainfall prevailing in the district and the absorbent soils prevalent in the southern areas, these measures are adequate and normally prevent any serious flow of water or any soil movement. In the northern parts of the district, where the soils are lighter and more erodable and where rainstorms of violence periodically occur, the standard strip width has its disadvantages and on the steeper slopes a narrower strip width and a smaller vertical interval might be used with benefit.

231. In Toro, the fantastically steep slopes of the Ruwenzori foot-hills present an especially difficult problem particularly as the population densities are high and the cultivation extensive. In parts of the Busongora and Bunyangabu Counties the system of block cultivation has been introduced with advantage and this development is now being expanded.

In the other areas of the hills however, where it has not yet been possible to get block cultivation adopted, the system of bunding on a standard strip is unsuitable and as it would be almost impossible to get a strip worth cultivating if the vertical interval was reduced to a reasonable figure, these areas are in some danger. Mwenge and Kyaka counties have improved steadily during the year and the abandonment of the usual haphazard methods of cultivation there in favour of the voluntary concentration of plots into large group farms has been a notable advance.

232. Over the rest of Toro, conservation measures of a kind are practised but here also, as in Kigezi, destruction of the strips and bunds during cultivation is all too common. Progress on the construction of conservation measures when the land is first opened has however been good and early in the cropping period few fields lack some protection whether it be an earth bund, a grass strip or a trash line.

233. The development of producer co-operative societies has made rapid progress in Bunyoro and as a result, block cultivation is now well established on the lands worked by the societies. Within the blocks, normal plot widths are used with a strip of natural grassland left between the cultivated plots. A six foot width for the grass strip is advised but this has, up to the present, been a council of perfection not yet attained. The normal width is between two and four feet and although this has a very useful effect, breakages do periodically occur.

234. Conservation work on individual holdings varies very considerably and although measures of one kind or another have been adopted in most places, there is still a great lack of uniformity in practice. Plot widths vary markedly, even on the same holding, and despite good work done during the year to standardise the width of plots in areas of comparable slope, only slow progress can be reported so far. A marked advance has however been made in the cotton growing areas of Biseruka where narrow contour plots protected by grass strips are now the common practice.

235. The enormous size and diversity of climate and topography in Ankole militate against a great concentration of effort in any one area. The field staff are thinly scattered and in spite of very creditable efforts on their part, the general application of conservation measures is not so common as in other districts. On more gentle slopes, the grass strip between cultivated plots is the advised practice, as it is in the eastern parts of the district where population densities are much lighter. In the western and north-western areas where the slopes are generally much steeper and the population comparatively dense, grassed bunds are considered essential.

236. In the various areas fair progress with these techniques has been made during the year in the face of considerable apathy exhibited by the cultivators. Where Ankole does score in conservation however, and has probably made more progress during the year than any of the other districts, is in the improved standard of maintenance of coffee and banana plantations. Mulching particularly in coffee is much more widely practised now as a result of the extension work done during the year.

237. An especially difficult problem in conservation has to be tackled in the hill grazing areas where the position is aggravated by overstocking and the indiscriminate burning of the pasture. The question of overstocking is receiving the attention of the Veterinary Department but the control of fires is unlikely to be achieved until such time as the stockowners (and others) can be persuaded that whereas fire used with discrimination can be beneficial, haphazard burning is harmful.

AGRICULTURAL EDUCATION

238. The gamut of work of the field staff is in effect educative and covers not only the routine day to day consultations with cultivators—certainly the most important part—but also the organisation of soil conservation competitions, agricultural shows, inspection and advice on school gardens, the preparation of newsletters and advice leaflets as well as arranging for visits by groups of farmers to different parts of the district or even other districts.

239. The main educational work, that of touring extensively and consulting with farmers individually and collectively, has been well maintained in all districts during the year. Much of the work has been directed towards inculcating an appreciation of the vital need to protect the land from damage and this has been furthered by the soil conservation competitions which are now a regular feature of the year's work. There is no doubt that these competitions are having an appreciable effect on the outlook of the local people on the advice tendered by the departmental staff and while, doubtless, much of the interest in the competitions is centred on the possibility of being able to win a prize of considerable monetary value, the advantages of the practices advocated are gradually being appreciated.

240. Agricultural shows at a county level have been held at intervals in all districts but the effects have not been all that could be desired. Exhibits have varied enormously and the conclusion cannot be escaped that on the whole, interest in such displays is lukewarm. The number of crop exhibits contributed seems to depend largely on the energy and interest of the local chiefs, the bulk of the population regarding the matter more in the light of a day's free entertainment than something that concerns them closely.

241. Newsletters and advice leaflets have been used with moderate success in some districts but naturally with a largely illiterate population, their application is limited. It has been found that the best use can be made of them at the start of a particular campaign. Departmental staff hold meetings of cultivators using the leaflet as the basis of their address and thereafter distribute the leaflets to literate members of the audience to browse over and discuss with their neighbours.

242. Distribution of leaflets and newsletters through the chiefs has not proved a great success. Few, if any, get far afield and without careful explanation as to the whys and wherefores of the information contained in them the value of the communication is lost.

243. While on tour, regular visits are paid by the staff to school gardens to advise on and assist with the work being carried out. Interest is stimulated by the organisation of school garden competitions and as far as it goes, this work has produced some results. The difficulty has been the maintenance of the gardens during the school holidays and as always happens, continuity is lost by the break between the terms.

244. Refresher courses for the junior field staff were organised in Ankole and Toro with stimulating effects. Not sufficient attention has yet been paid to this aspect of education as it effects agriculture in the districts but the matter is in hand and rather more ambitious programmes are planned for the future. Good use of the funds available has been made to convey parties of farmers and staff on visits to various parts of the individual districts and in the course of these visits the demonstration farms have proved very useful centres of instruction. At some of the farms, short courses for chiefs were arranged at the request of the Administration with encouraging results and it is hoped that it will be possible to increase the scale and frequency of these courses in the future. Combined visits of chiefs, farmers and staff to other districts were arranged as and when possible and although much of the demand to go on these visits is inspired by a desire for a change of scene rather than a thirst for knowledge, they do stimulate interest and, sometimes, promote discussion which is often valuable.

PROGRESS AND EXTENSION

245. Extension work in general ties up so closely with the wider aspects of agricultural education that the extent to which policies have been put into practice is, in fact, a measure of the success of the educational effort. Unfortunately, the wayward fancy of the cultivator switching as it is prone to do, from crop to crop depending upon cash inducement offered, is a stumbling block in the way of development of better practices as far as annual crops are concerned. The exceptions are cotton and tobacco which under present conditions ensure a steady income and with these considerable progress has been made in improving methods of culture although a great deal still remains to be done.

246. Greater progress is possible with permanent crops and in all districts where coffee and bananas are grown on any scale the extension of mulching, pruning, manuring and pest control has been quite gratifying. The soil conservation competitions have played a large part in achieving some of the results, as points are awarded to general standards of husbandry with particular reference to the maintenance of soil fertility in addition to those allotted to the purely physical aspects of soil conservation. In Ankole and Toro mulching of coffee and bananas is steadily becoming more widely practised and there is a gradual improvement in the standards of work. Manuring is still very spasmodically done but there are indications that where cattle are kept and dung is available in reasonable quantities, much more interest is now being taken.

247. Pest and disease control still present many problems and it will be long before cultivators, of their own accord, take steps to eradicate pests and destroy diseased plants. A very promising beginning has been made in Toro on the control of *Antestia* and it is probable that a similar development will take place shortly in Ankole.

248. Tobacco is one of the more important crops in Bunyoro and is rapidly coming to the fore as the major cash crop in Kigezi, and considerable advances have been made during the year in the standard of planting, maintenance in the field and in curing.

249. Cotton growing in Bunyoro is now reaching a fairly high level and although in Toro much remains to be done, a better standard than usual was achieved this year.

250. Interest in mechanical cultivation is steadily increasing and there are regular demands from the people in Bunyoro and Toro for a large extension of the services already provided. In most areas unfortunately, there is still but little appreciation of the limitations imposed on tractor cultivation by the nature of the land and vegetation although in Bunyoro there has been a marked improvement during the year. The economics of mechanical cultivation are still improperly understood and the use of machinery is too frequently looked upon as the solution to all local agricultural ills.

PESTS AND DISEASES

251. Few parts of the province were entirely trouble free during the year but happily none of the attacks suffered were unduly serious.

252. Locusts made two brief appearances. The first in April when reports were received of small swarms in Toro, Kigezi, Bunyoro and Ankole, and the second in November, confined on this occasion to Bunyoro. Slight damage was caused on both occasions to crops in Bunyoro but in the other districts little harm was done.

253. Aphids were responsible for a certain amount of damage to the young cotton in the escarpment areas in Bunyoro and to the autumn sown pea crops in Kigezi. The infestation on the cotton soon dispersed, without serious damage, but the pea crops in Kigezi suffered a fairly serious set back.

254. *Antestia* bugs on coffee in western Ankole and the mountain areas of Toro caused damage to such an extent in places that no crop at all developed. Fortunately the areas most heavily infested are comparatively small and trial dustings with Pyrethrum powder proved sufficiently effective to warrant the hope that complete elimination can be achieved. Dusting equipment is available for sale to the growers and the campaign to bring the bug under control is gathering momentum.

255. Banana weevil continues to be one of the major pests in most of the districts and is likely to remain so for a long time to come. Despite the improvement that has been achieved in the general standard of plantation management, that little extra effort required to combat the weevil has not yet been inspired.

256. Heavy infestation of tobacco eelworm in all the tobacco areas in Bunyoro was again noticeable this year. The intensity of infection varies markedly but there seem to be no areas completely free.

257. *Lygus* attack on cotton was negligible in most areas in Bunyoro. Parts of Busongora county experienced a moderate attack. Stainers were common at the tail end of the 1954/55 season in both zones and as a result of delays in uprooting and burning the old crop in Busongora there may be a large carry over there into the new cotton.

258. Other pests reported, either as single observations or of very limited incidence have been Stalk borer in maize and sorghum in Toro and Ankole; scale on cassava in Bunyoro; scale on groundnuts in Toro; mealy-bugs on coffee in Toro; coffee berry borers in Toro and Ankole; a coffee stem borer in Bwamba, and a caterpillar on tobacco flowers in Bunyoro.

259. The two diseases which have had the most serious effects have been "Pasmo" (*Sphaerella Linorum*) disease on flax and "frog-eye" (*Cercospora Nicotianae*) on tobacco, both confined largely to Kigezi District although the flax growing areas in Ankole suffered some attacks of "Pasmo".

260. The flax crop throughout the growing areas was attacked to some extent and, where soil conditions were at all poor, the attack was extremely heavy. The variety *Hollandia* was slightly less heavily infected than *Stormont Gossamer* probably due to the fact that it was grown on the best land. Considerable loss of crop occurred as a result of the disease.

261. "Frog-eye" proved a very serious menace to the air-cured crop in the wetter parts of Kigezi and when it came to marketing, as much as 50% of the leaf offered at certain markets had to be rejected. This is a prohibitive burden to lay upon the growers and as the crop is assuming very great importance in the district, work is to be undertaken on nursery spraying to combat the ravages of the disease.

262. Blackarm was inconspicuous and careful search had to be made to find any diseased plants at all. Surveys carried out on the crop in Bunyoro indicate that as a result of seed dressing this year, the incidence has dropped from 63% to 7%.

263. Panama disease in Ankole is still widespread but does not seem to be causing any major losses except amongst a few varieties of sweet bananas. The first record of the presence of this disease in Toro was made in Bunyangabu county in June, since when outbreaks have been identified in two other sites in the same county. Kigezi and Bunyoro Districts appear to be free at the moment.

264. Mosaic diseases in cassava are still prevalent throughout the province and the campaign to limit their incidence by the issue of resistant strains continues.

265. Crinkle-leaf virus in tobacco was reported on several occasions in Kigezi and from Toro came one report of *Armillaria* root-rot in coffee but these are the only other diseases of any significance that were recorded.

266. A disease, believed to be *Armillaria* was reported from a non-African coffee estate on the fringes of the Budongo forest in Bunyoro.

267. One report only, from Bwamba in Toro, was received of an attack of *Puccinia polysora*.

EXPERIMENT STATIONS

268. The stations in the province were maintained during the year primarily as demonstration centres in support of the educational and extension services. Soil conservation, the maintenance of fertility by mulching, manuring, night paddocking and crop rotation being particularly stressed. The establishment and espacement of permanent crops, pasture improvement and the use of mechanical cultivation where feasible as well as trials with introduced crops which might prove of local value, also received attention.

269. At Rubare, which for many years had been heavily infested with "Lumbugu" (*Digitaria scalarum*) the whole of the arable area was out of cropping during the spring rains. Repeated cultivations during the first seven months of the year had the desired effect of ridding the ground of the weed and it was possible to continue normal cropping in the autumn rains. Contour bunds were re-constructed but in view of the danger of reinfestation these were not grassed down. The trials for the selection of finger millet, sweet potato, and groundnut varieties were continued but growth was rather disappointing. Crops were coming to maturity in December and harvest is expected to begin in January. A trial planting of barley was established to ascertain whether this crop could perhaps be grown extensively in the area for sale to the breweries. Early growth was excellent but in the later stages rust attack was heavy. Of the three varieties grown, Research appeared best with Abed Kenia second and Herta a poor third. The heavy mulching adopted last year in the bananas has improved the appearance of the plants enormously. Roguing is being continued to establish the varietal lines. The arabica coffee plot produced its first light crop during the year but the robusta still lags behind and it is unlikely to come into full bearing for at least another two years. Neither type is doing as well as it might and it is suspected that trace element deficiencies may be responsible. Soil samples for pot testing have been taken and once the results are available it should be possible to deal with the matter.

270. The observation plots at Rushozi were continued. Yields from the spring crops were very poor because of the erratic rainfall coupled with extensive game damage. Sweet potatoes, maize, groundnuts and finger millet were especially favoured by the animals. The autumn crops were however excellent and production will probably be the highest yet from these plots. It has in fact, now been clearly shown that in this particular settlement area a wide range of crops can be grown successfully provided the game is kept out. A variety of trees and a hedge have been established round the perimeter of the plots with a view to testing the effectiveness of such protection against the incursions of the commoner types of buck.

271. Work on the Kyambogo Farm has been directed more particularly towards the establishment and maintenance of the permanent crops, bananas and coffee. Night paddocking of the cattle on a rotational system, introduced originally to combat "lumbugu" infestation, has had a most beneficial effect on subsequent cropping but has not entirely answered the "lumbugu" problem. The trampling does not kill the "lumbugu" but does make it much easier to deal with when the land is re-opened. Annual cropping was on a limited scale and confined mainly to the bulking for selection of maize, sorghum, finger millet and groundnuts.

272. Cropping at Kachwekano was on the whole confined to the growing of stock feed and the maintenance of museum collections. The trials that were carried out were with barley, wheat and tobacco and although it is too early to state precise results, yields of malting barley of up to 3,000 lb. weight of grain per acre have been obtained; wheat has yielded very nearly as much and the tobacco produced approximately 370 lb. of cured leaf to the acre. The pasture work at Kachwekano is described under the appropriate head.

273. At Bulindi the main emphasis was again on the cotton variety trial and the production of "Heavy Western" tobacco seed. The cotton was planted in late June and despite the rather dry weather early in the growing period, came away well. *Lygus* caused a certain amount of damage without being unduly serious. Small-scale picking began early in December.

274. Three acres of tobacco were planted out and on the fresh land, two acres of which was early planted, a very good stand was obtained. On the third acre, which was on previously cropped land and therefore not planted so early, the crop was very patchy and yielded poorly. In all, 231 lb. of clean seed were harvested. Some damage was done to the crop in the flowering stage by a caterpillar which devoured the blossom. The established plantations of coffee, bananas and the orchard were maintained and in the orchard a considerable programme of replacement was carried out as many of the trees had become so old as to be useless.

275. Cultivation on this station is normally done with a tractor and plough hired from the Special Development Section and while work is going on the opportunity is taken to arrange for visits by local farmers and members of co-operative groups. The people in the district are keenly interested in mechanical cultivation and are fortunately, beginning to realise its limitations as well as its advantages.

276. The observation plot of coffee at Bugangari in Kigezi, cacao at Nyaruru in Toro, manilla hemp at Ruigo in Toro, the tea plots at Kaziba in Kigezi and Mwenge in Toro and the district seed plots at Kyanjoio in Toro, were also maintained during the year.

ANIMAL HUSBANDRY AND PASTURE WORK

277. Only at Kachwekano and Kyembogo are cattle kept. The Kyembogo herd has been run primarily in connection with the night paddocking trials and has not so far been developed as a productive unit.

Very heavy culling was done during the year and all the poorest animals have now been disposed of. With the remaining animals the intention is to build up a small herd of dual purpose beasts but to do this it will probably be necessary to bring in some better type Zebu cows from the Eastern Province. The Kachwekano herd of predominantly polled Ankole type cattle was also heavily culled during the course of the year. The calving interval in the herd appeared to be unduly long and as it was suspected that the low cobalt status of the soil might be the cause, cobalt enriched mineral salts are now being supplied. It is as yet too early to notice whether this has been effective, but presuming it is, milk production, by virtue of having more cows in milk at any one time, should show an appreciable increase. The grazing trials, which consist of two acres each of Kachwekano mixture, a general mixture, natural regeneration and permanent pasture were continued. Grazing these pastures began in 1954, a group of six cattle of approximately equal group weight being assigned to each treatment, and although the full results will not be available until the rotation has been completed, Kachwekano mixture has so far proved superior in carrying capacity.

278. Attempts in Kigezi District to encourage rotational night paddocking to obtain improvements in subsequent crop yields, as well as to improve pasture, have met with some success, but efforts to start rational grazing in the predominantly cattle areas have been nullified partly because of an unsatisfactory design of the rotational areas and partly because of over-stocking problems.

IRRIGATION AND SWAMP RECLAMATION

279. Because of the pressure of population, Kigezi is the only district which has so far attempted to utilise swamps on any scale for food production and grazing. Limitations are imposed on the extension of this development by the fact that many of the swamps are inclined to be acid, the acidity becoming much greater with cultivation and subsequent drying out. Investigations have been carried out on ways and means of preventing the development of undue acidity, but the difficulties of application in the field are considerable.

280. During the course of the year an examination of the swamps was carried out by the firm of Sir Alexander Gibb and Company and until such time as their report is available, no new work on swamp reclamation is being undertaken.

281. Of the areas at present in use, cultivation was extended on Kitundwe, Mumwalo and Nyarutovu swamps, sweet potatoes being the main crop. Work was also carried out on the drained area of the Kashambya swamp early in the year and during the mid-season dry spell, this was fully utilised. The southern area of the swamp was surveyed for possible future extensions.

282. The experiment on the reclamation of the dead swamp at Nyanja was continued. The last crop of sorghum gave no significant results between treatments but further experiments are to be conducted

after additional liming has been done. The Bwindi swamp which was drained for investigational purposes was planted with rice. A very poor chlorotic growth resulted and pH tests revealed a very high acidity even although the water table had been constantly maintained at a high level.

283. Whilst no particular reclamation schemes were put in hand, the early onset of the dry weather led to a marked increase in the swamp edge planting of sweet potatoes on the traditional raised bed system.

RESETTLEMENT

284. The serious problem of an ever increasing population on a strictly limited area of land faces several parts of the province. At present the most congested area is the southern half of Kigezi District comprising Ndorwa, Rukiga and Bufumbira counties and most of the effort in regard to resettlement has been directed towards a movement of people from these counties to the northern and less densely settled parts of Kigezi or into those portions of Ankole and Toro Districts which have been approved as settlement areas.

285. There are however, other areas, notably the mountain slopes of southern Busongora and Bwamba in Toro, where population pressure is increasing steadily and from which movement of population will have to take place in due course.

286. The land utilisation survey in Kigezi, begun in 1953, was completed this year and the facts and figures obtained serve to emphasize the gravity of the position in that district. If best use is to be made of the resources available to ensure that the land is farmed on stable economic basis, approximately 100,000 people will have to settle elsewhere and once the migration has been accomplished, a very great measure of re-organisation will be necessary within the district itself. Throughout the year surveys of potential settlement areas were continued and it became increasingly obvious as time went on that the areas available in Kigezi, Ankole and Toro could not possibly absorb more than a small fraction of those required to move.

287. A fairly steady flow of settlers was maintained during the year and most of the better areas in Ankole have now reached saturation point. So much so, that some adjacent areas, not specifically included in the settlement, have been occupied. Space is still available in the areas less favoured climatically but naturally there is a reluctance on the parts of the Bakiga to take up land less attractive than that from which they have come and it is probable that these areas will not be fully occupied until pressure in Kigezi becomes intolerable. This is an unfortunate aspect of the situation because there is as yet, hardly any appreciation amongst the Bakiga that conditions in their own country are serious and, in consequence, they tend to look upon resettlement not as a means to concentrated development of the new areas but rather as an opportunity to pick the eyes out of the country.

288. Where parts of Toro District were made available about the middle of the year, the previous form of rather haphazard settlement was no longer countenanced and a planned lay-out of the area was agreed upon before any settlers moved in. The demarcation and limitation on the size of holdings was of course most unpopular and strenuous efforts were made to have the decision to proceed with planned settlement rescinded. To permit further spread of the traditional methods of subsistence agriculture would however, dangerously prolong the delay in developing a more stable system of land usage and planning is therefore being insisted upon. The idea is new and it is likely that until it has been accepted, settlement in Toro and in any other areas which may subsequently be opened for development will be slow.

289. The Nyakatonzi development area in Busongora, planned with the object of encouraging a migration of the Bakonjo, from the crowded mountain slopes to the lower plain land, is now well established. The boundaries have been agreed upon and demarcated and cultivation is expanding rapidly. Efforts have been made to settle people on individual holdings but at present they prefer to cultivate on the group farm system on blocks of up to 40 acres. With the exception of the maize planted in April, which was a complete failure, yields have been excellent and it has been a most profitable year for the farmers.

290. The lack of water and building materials have continued to be limiting factors in getting settlers to remain permanently in the area but these two deterrents are gradually being overcome. The water channel from the Kanyampara river had to be re-surveyed as the original cut had gone seriously off line, and some two miles of the new channel have now been completed. As soon as the channel is finished the whole of the development area will have an adequate supply of water.

291. An extensive tree planting scheme calling for 200 acres in four years is under way to provide the necessary building poles. Some 25 acres are already established and it is expected that poles from this portion of the plantations will be available within the next two years.

292. Resettlement schemes can of course only be considered as palliatives since the problem of total population increase remains.

LIAISON WITH LOCAL GOVERNMENTS AND OTHER DEPARTMENTS

293. Very satisfactory relations have been maintained in all districts between the Department, African Local Governments and other departments. This co-operation has contributed very largely to the success with which development plans for the various districts have been inaugurated and finalised and has resulted in a much closer integration of work in the field. Where some friction has periodically arisen is in the implementation of the various schemes. To all intents and purposes the executive officer in the field is the local chief and with the multitudinous duties that fall to his lot, it sometimes happens that some aspects of work in which he is not particularly interested are left in abeyance. This is, however, largely

a matter of education, in the sense of developing an appreciation that all aspects of the work are part of a co-ordinated whole. and this is in fact slowly happening.

NON-AFRICAN AGRICULTURE

294. In Toro the principal crop remains tea. Erratic rainfall at intervals and a prevalence of hailstorms during certain months did a considerable amount of harm but by and large, the season was quite successful. Two factories were in operation throughout the year and a third in the course of construction.

295. The non-African coffee estates can only be classed as fair and the maintenance of many of them leaves much to be desired.

296. In Ankole, work is proceeding on the development of a tea estate in the neighbourhood of the Kalinzu forest under the direction of Agricultural Enterprises Ltd. Seed beds have been established and work is proceeding on the construction of buildings.

297. In Bunyoro, where the bulk of the estates are now in the hands of Asians, coffee has been the principal interest. Extensive stumping of very old plantations has been carried out and a limited amount of new planting.

298. Papain and rubber production have been more or less at a standstill, and there is no great interest taken in these crops at the moment.

299. A new departure has been the planting of a very considerable acreage of sugar cane on the Hoima River and Bunyoro Estates at Bugomolo.

300. The big sisal estate at Masindi Port, formerly the property of Messrs. Uganda Sisal Estates Ltd., was in production throughout the year. The property is now in the hands of Messrs. Nile Estates Ltd.

B. FOOD CROPS

FINGER MILLET

301. In all districts where advantage was taken of the early rains to get the crop sown, quite reasonable harvests were gathered from the early plantings. Some damage was done by heavy rain to the standing crops in Kigezi but elsewhere little harm occurred. Later plantings, that is those sown from mid-March onwards, did not fare so well and in Ankole in particular, yields were seriously reduced in some cases to negligible proportions. The autumn crop was planted betimes in an attempt to make up the short-fall in supply and despite some destruction wrought by heavy rain and hail, adequate quantities were available by the end of the year.

SWEET POTATOES

302. Only in Bunyoro was there any difficulty in regard to supplies. Spring plantings were late and the young vines suffered the full effects of the dry weather with disastrous results. A very large acreage was lost

and it was not until well on in the autumn rains that the position was retrieved. It will not however, be until the early new year that supplies will be freely available.

303. The position in Kigezi also was not satisfactory for a while and it was only after large increases in swamp plantings had been made in June and July that the situation returned to normal.

BEANS

304. In general the position in regard to this crop was satisfactory from the point of view of local food supplies. A big reduction in yield resulted from the dry weather but this affected the sales for cash rather than the local food position. Extensive autumn plantings were carried out and supplies were abundant from late November onwards.

BANANAS

305. No shortages occurred at any time in any of the districts but where the drought was particularly severe while it lasted, notably in Ankole, Bunyoro and parts of Toro, the plantations received a severe set-back and it is anticipated that many of the suckers which should be coming to maturity for harvest in the new year will produce undersized bunches. No serious shortfall is expected but supplies may not be quite as plentiful as usual.

306. A special campaign to encourage the planting of cooking varieties was carried out in Bunyoro during the year to counteract the present fast spread of the beer making types, a spread which is threatening the maintenance of eating bananas in several areas.

CASSAVA

307. In Toro and Bunyoro satisfactory acreages were maintained throughout the year. In Ankole the situation was not as good as it might have been especially in those areas where finger millet is the traditional famine reserve crop, but sufficient was available to meet all demands. The crop is not widely grown in Kigezi and does not enter largely into the normal diet.

GROUNDNUTS

308. Very extensively cultivated in all districts except Kigezi although even there the crop contributes usefully to the food supply. Losses of crop were heavy in the Mwenge and Kyaka areas of Toro in late May and June and reduced yields were also reported in Ankole. In fact, between the heavy rain early and late in the year and the severe dry spell in between, production was extremely low for the acreage planted but not so low as to prejudice supplies for local consumption.

MAIZE

309. Failures of crop occurred in Mwenge and Busongora in Toro, and in parts of Ankole but as the crop is not as yet a staple food, alternatives were used instead. A few scattered plants are normally grown in the bulo, bean and sorghum crops and the cobs eaten green.

PEAS

310. An important foodstuff in Kigezi and parts of Ankole. Elsewhere of very minor importance. The harvest obtained in Kigezi from the 1954 autumn plantings was excellent and plentiful supplies were available in the early months of the year. The spring plantings suffered in the early stages from too much rain, and in the later stages from too little. Added to which Aphid attack was severe and in consequence, yields were low.

311. Except for a limited period in June/July conditions in Ankole were unsuitable for drying the crop and as the wet produce was unsaleable, much more than usual was consumed locally.

SORGHUM

312. Grown extensively in all districts, more particularly for brewing in Toro, Bunyoro and Ankole. In Kigezi it is the staple food cereal in the southern areas. The Kigezi crops promised well in the early stages but with the onset of the dry weather yield prospects were considerably reduced on the more impoverished soils. Fair yields were obtained from swamp plantings.

313. Despite the fact that the beer sorghums yielded moderately well the demand for grain for brewing greatly exceeded the supply.

ENGLISH POTATOES

314. These are becoming a popular food with the Bakiga in Kigezi, largely replacing sweet potatoes in a number of areas. Apart from an appreciation of the quality of the solanum potatoes, this trend has been furthered by the poor growth of many of the sweet potato varieties which are heavily infected with virus disease and yield but poorly.

315. No serious shortage of supplies was apparent except for a month or two from July onwards until the autumn crops were lifted.

C. ECONOMIC CROPS

COTTON 1954/55 SEASON

316. The unseasonal rain in Toro in January and February as well as doing a considerable amount of damage to the crop and thereby reducing the yield also had a delaying action on marketing. This was particularly noticeable in Busongora, in which area no more than 30% of the crop had been purchased by the end of March, and necessitated an extension of the buying season for a further two weeks up until the 14th of May. Two special buying days had also to be arranged at the beginning of June to deal with late deliveries from Kyaka and Bwamba. Generally speaking, the quality of cotton was of a reasonable standard throughout the buying period.

317. In Bunyoro the heavy rains at the end of January spoiled some of the later plantings although the damage was not so serious as was at one time feared. Nevertheless, the quality of the cotton presented for

sale in the early part of the season was so poor that buying was closed down for a period between the 10th and 24th of January to rectify matters. This was only achieved after considerable exhortation but from the end of January until the season closed on the 16th of April, the improvement was maintained.

COTTON 1955/56 SEASON

318. Preparation of land in Bunyoro for the crop was well in hand by the end of April and cultivation of plots continued until late in July. Only a small acreage was planted in May due to the fact that delays in construction of the seed dressing plant held up deliveries to distribution points, but once seed was available in quantity, progress was rapid and all planting had been completed by the middle of August. The dry spell in mid-June over the whole district had a deleterious effect on some of the earlier plantings and dry spells in July in the escarpment areas affected later plantings there, otherwise conditions were reasonably good.

319. Crops along the escarpment matured quickly and picking on a small scale began in late September. Marketing was therefore opened in these areas on the 19th of December. Buying is to open in the rest of the district on the 9th of January, 1956.

320. Twenty-seven and a half tons of seed of a new strain (N.C.54) were received in early May and issued for planting in the Kyangwali and Kabwoya areas. Germination was excellent and the crop appears to be promising.

321. In Toro, cultivation of plots began in Mwenge and Kyaka in June and in Busongora in July, but planting was delayed until late July by the dry weather. Thereafter progress was satisfactory and all plots had been sown by the beginning of September. Growth was good in all parts of the district with the exception of limited areas in Busongora where, as the result either of late planting or a spell of dry weather while in the seedling stage, the plants were stunted.

COFFEE

322. Heavy flowering in January and February in Toro, Bunyoro and Ankole gave early promise of good crops in these districts and, as it turned out, the promise was largely fulfilled. The early rain in Toro and Ankole ensured a good set of berries—so good in places that bushes were grossly overloaded—and development was sufficiently far forward when the dry weather set in to preclude any serious losses. One curious effect of the rainfall in January, February and March was to prolong the flowering much beyond the usual period and it was common, late in the year, to see flowers, young berries and almost mature cherry on one and the same tree.

323. In Bunyoro the lack of steady rain in the early months had a serious effect on young trees and a large proportion of the crop on these was shed. Mature trees did not suffer to the same extent and, despite the losses, a bumper crop for the district was harvested.

324. Losses in ill-maintained plantations in Ankole were high but nevertheless the crop was well above average.

325. In Kigezi the main flowering was not until July and as weather conditions from then until the end of the year were satisfactory a reasonable crop is expected.

326. With the varying conditions within each district in the province there is of course no clear cut season for coffee. Extended and variable flowering leads to long drawn out picking and preparation, a state of affairs exaggerated this year by the abnormal weather. Marketing is therefore almost continuous except during periods of heavy work connected with the planting of food crops or when closure is declared by notice in the official *Gazette*.

327. Picking of the tail end of the 1954 crop in Kigezi continued through May this year, and sales of the prepared cherry were recorded as late as June and July. Marketing closed for a month in October but by the opening of the new season on the 1st of November, small quantities of the 1955 crop were already coming forward.

328. Concurrent with the development of the 1955 crop in Toro and Ankole, sales of dried cherry and rough hulled coffee from the previous crop were taking place. In Bwamba in particular there was a heavy rush on the markets consequent upon rumours that the price was likely to fall. Large quantities were sold in January, February and March, and again in June, the total crop being one of the biggest recorded for the district.

329. In Ankole on the other hand, although there was a very big crop in sight, only a small proportion, as recorded sales at coffee markets was delivered through the normal channels. The method of disposal of the rest is a matter for conjecture.

330. Marketing of the remnants of the 1954 crop was completed in Bunyoro in January and February and there was little market activity from then until the end of July when picking of the new crop began on a small scale. Increasing quantities came on the market in September/October and fairly heavy sales were maintained until the end of the year.

331. In the early part of the year, before rumours of lower prices had blunted the edge of enthusiasm, tremendous interest was taken in the extension of the crop and the demand for seedlings far exceeded the supply in most districts. Interest slackened somewhat abruptly after the declaration of the new coffee prices in April although a fairly steady demand remained in Bunyoro and Ankole. In fact, in Ankole, the demand was high throughout the year and an enormous number of seedlings was issued. Even assuming a 50% loss in the field, a sharp rise in production can be anticipated within the next four or five years.

332. The bulk of the issues took place during the early rains, issues for the second rains being comparatively small except in Ankole.

333. Other than in Bunyoro and Ankole, where losses after transplanting were high, most of the new plantings appear to be well established.

Fire-cured (Bunyoro)

334. As a result of the higher prices announced at the end of 1954 considerably more interest was taken this year and the number of growers recorded (10,484) showed an increase of some 4,000 over those who cultivated the crop last year. It was unfortunate that the weather was so peculiar because the dry spells in April, May and June held up planting to such an extent that seedlings were over-grown before suitable conditions for transplanting occurred and there was in consequence a high wastage of planting material. Hailstorms in July caused some damage, so severe in small areas as to cause a complete loss of crop but otherwise losses in the field were surprisingly low. As was to be expected, however, growth was uneven and the general quality of the leaf lowered.

335. Eelworm infection in the field was common with a very high incidence noticeable in the Pakanyi area in particular.

336. Harvest and curing began in August, continuing until October. The appearance of the leaf in barn was better than might have been expected and a very reasonable standard of cured leaf was achieved. The crop was purchased during November and early December the bulk going to the East African Tobacco Company.

Air-cured (Kigezi)

337. The harvest and preparation of the 1954 autumn sown crop began in January, reaching its peak in February. Wet weather, hail and a high incidence of "Frog Eye" caused a lot of damage, "Frog Eye" being particularly severe in Muko, Rubanda and Rutenga and from 50% to 90% of the leaf offered for sale at these markets had to be rejected altogether. Marketing was completed in June.

338. Nurseries for the production of seedlings for the spring crop were sown in January and February. Keen interest was shown by growers throughout the district and the demand for planting material was large. Transplanting extended from late March through to early May and it was at first hoped that a very large crop would be harvested from the greatly increased acreage planted. Weather conditions were, however, not ideal for tobacco and the hopes were not realised. The dry spell in June/July and the very heavy rains in the following months, (not to mention the periodic hailstorms) played havoc with a large proportion of the crop. The early picking adopted by many growers to avoid the possible risk of losses from the hail also had a lowering effect on the quality and altogether results were rather disappointing.

339. In spite of the difficulties, interest remained keen and a good start was made on the autumn crop. Nurseries were sown in August and transplanting took place in September and October. Rainfall was heavy until towards the end of November but during late November and the whole of December weather conditions were not so violent and at the end of the year prospects of a satisfactory harvest were reasonably good.

Flue-cured (Kigezi)

340. Buying of the autumn crop was completed in February, but here also, the quality was disappointing. This was possibly partly due to the remarkable variation in the field, caused apparently by differences in fertility some of which may have been due to temporary nitrogen deficiency in newly opened land and partly to damage by hail and the effects of crinkly leaf virus.

341. Cultivation for the spring crop was on an increased scale and the demand for seedlings far outran the supply. Transplanting was completed by the end of April and as most plots were established by the time the dry weather set in, growth was quite satisfactory. The dry weather brought the early plantings on quickly and marketing was opened on the 2nd of June. It was on the whole a disappointing season due to the early dry weather and although the cured leaf was of a good colour it was rather on the thin side.

MAIZE

342. Maize is not grown extensively in the province but each year a small amount surplus to the requirements of the local people is available. The bulk of the surplus from Kigezi, the Busongora county in Toro and the western areas of Ankole is purchased by mining concerns as rations for their labour forces while the production from Mwenge and Kyaka in Toro and the whole of the Bunyoro crop is taken up by tea and coffee estates or by millers. Very little if any of the maize is actually exported from the province.

343. The 1954 autumn crop was good in most areas but the price offered (8 cents to 10 cents per lb.) did not attract growers and this was reflected in a substantial decrease in acreage in the spring sowings. The early planted crop in Toro was reasonably good but later plantings in all areas suffered from the drought. Yields were low and although supplies were generally sufficient for local food requirements, little or none was available for sale.

344. Autumn plantings were also on a reduced scale, except in Ankole, and it is probable that the quantities likely to be offered for sale in the new year will be small.

GROUNDNUTS

345. Although this crop is widely cultivated in the province it is only in Ankole that it assumes any importance as a major cash crop. Small sales are recorded in Toro and Bunyoro but such sales only normally take place if the price is sufficiently attractive. It is however, becoming increasingly popular as a foodstuff, more especially perhaps in Bunyoro where it is tending to oust simsim in popularity.

346. The acreage under the crop in Ankole has dropped rather sharply during the last three seasons, that is in the autumn crop of 1954 and both crops this year, the main reason being a drop in price from about 60 cents per lb. in July last year to an average of about 30 cents a lb. since then.

347. The growth of the spring crop was poor and this was aggravated by poor maintenance. Yields were consequently low and only small amounts were offered for sale. Drying the crop presented considerable difficulties and much of what was offered in the markets was very damp.

348. The autumn plantings were on an increased scale and with rather more favourable conditions for harvesting and drying towards the end of the year, a surplus of some 2,000 tons is expected.

FLAX

349. During the 1952/53 and 1953/54 seasons the industry worked at a loss due in the main to poor raw material caused by disease, yielding an indifferent outturn of fibre to straw. In an endeavour to stem the decline, seed of the Hollandia strain which was reputed to be disease resistant and a heavy yielder was introduced in 1954 and high hopes were held that this variety would provide a better return per acre and therefore a greater inducement to the growers, whose interest in the crop was flagging. These hopes were, however, disappointed.

350. Dressed seed sufficient for 560 acres, which was the target figure aimed at, was distributed in early September 1954 and sowing was begun on the 25th of the month at the start of the rains. In all, 492 acres were sown of which 134 were planted to Hollandia and 358 to Stormont Gossamer. The areas selected for the issue of the Hollandia seed had in the past always given the best results and it was expected that marked differences would be observed but in the outcome, there was little to choose between the two varieties. Both showed a wide variation in growth and although Hollandia was on the whole less infected with *Sphaerella linorum* it was only conspicuously better than Stormont Gossamer in one or two areas.

351. Marketing of the crop began in the fourth week of January and was completed in February. Over the total purchases, Hollandia yielded a higher percentage of Grade I straw than did Stormont Gossamer but the difference of only 11.3% is not remarkable when it is remembered that Hollandia had been grown in the best areas. Had it been grown on less suitable sites as well, there would have been little to choose between the two. In regard to yields and returns per acre to the grower Hollandia proved inferior both as regards straw production and the quantity of seed. The lower yield of seed was particularly remarked upon by the growers and led to much adverse comment.

352. During marketing, when the straw was in bulk, scoring was carried out to assess the amount of disease attack. Kayonza area was undoubtedly the cleanest with Kamwezi a very close second. The attack seemed to vary from bundle to bundle of straw, some being completely free while others were virtually brown with the disease and there appeared to be no correlation whatsoever in relation to previous cropping. Plots previously planted with sweet potatoes and beans produced both diseased

and disease-free straw and the same could be said of the produce from land which had previously been rested. There was little to choose between the two varieties in regard to resistance to the disease.

353. Processing of the crop proceeded normally but the outturn figure of fibre to straw was below expectation and total production of fibre was therefore low. It is unlikely that the value of the saleable crop will cover expenditure and a loss on the third year in succession must be expected although the loss will probably be considerably less than in the previous two seasons.

354. From all points of view Hollandia did not come up to expectation and this, together with the various other points mitigating against the prolongation of flax cultivation in Kigezi and Ankole, led to the decision to close down the industry.

355. The seed was disposed of in September and the bulk of the fibre should be ready for sale early in the new year.

PEAS

356. A crop with considerable popularity in Ankole mainly due to the very useful cash return per acre in good years. Acreages naturally fluctuate within wide limits according to the price offered but generally an appreciable surplus comes on the market each year.

357. Conditions in January and February were against the proper drying of the autumn crop and much that was offered for sale was of inferior quality. The price fell to approximately 23 cents per lb. in May and remained at a comparatively low level for some months thereafter. Early plantings in the autumn rains were accordingly on a reduced scale. With an improvement in price to a level of between 30 cents and 35 cents a lb. in September/October, later planting were more extensive.

ENGLISH POTATOES

358. Only in Kigezi and parts of Toro is the crop grown to any extent as a cash crop but when it is grown it occupies a place of some importance in the economy. Most of the produce of Toro is sold within the district whereas, in normal seasons, a large proportion of the Kigezi crop is exported to Ankole and Buganda.

359. For most of the year supplies were plentiful but in July and August in both districts local shortages occurred and prices rose sharply from a level of approximately 10 cents per lb. to the neighbourhood of 25 cents per lb. As supplies improved again towards the end of the year prices tended to fall in Kigezi. In Toro the level remained comparatively high.

VEGETABLES.

360. Vegetable production on any scale only affects small areas in Kigezi although of course, the production in small quantities for sale to the dwellers in the Townships is common in all districts.

361. Although faced with gluts of particular vegetables at intervals, the Kigezi vegetable scheme continued to function satisfactorily throughout the year and the weekly delivery to Kampala of two lorry loads continued uninterruptedly. Growers participating in the scheme greatly benefited from a general raising of the price levels during the course of the year.



PLATE I

Chemistry Section pot experiment. Kawanda soil showing N and S deficiencies. Control treated with water only. [Photo by Dr. E. M. Chenery]



PLATE II

Chemistry Section pot experiment. Lugulambo soil showing N and P deficiencies and a slight shortage of S (note pale leaves). [Photo by Dr. E. M. Chenery]



PLATE III

Example of the kind of obstacle encountered by the tractor hire services in Buganda.
[Photo by Mr. A. D. Llewellyn-Jones]



PLATE IV

Opening new land at Ssenge Farm in Kyadondo County of Mengo District with large
 single mouldboard plough. *[Photo by Mr. D. Innes]*



PLATE V

Presenting the challenge shield at the prize-giving of the Agricultural Competition in Kyadondo County of Mengo District. [*Information Department Photo*]



PLATE VI

A plot of cassava resistant to the mosaic virus, also illustrating bench formation as a result of bunding. [*Information Department Photo*]



PLATE VII

Terrace formation by bunding in an African coffee plantation, Gomba County, Mengo District. [*Information Department Photo*]



PLATE VIII

Drying coffee in a well kept African homestead. Buganda Province. [*Information Department Photo*]



PLATE IX

Topping robusta coffee seedlings in the nursery. Buganda Province.
[Information Department Photo]



PLATE X

Robusta coffee seedlings ready for transplanting in a Buganda Province nursery.
[Information Department Photo]



PLATE XI

Tobacco for air-curing, Mubende District of Buganda Province.
[*Information Department Photo*]



PLATE XII

Suckering topped tobacco in Mubende District of Buganda Province.
[*Information Department Photo*]



PLATE XIII

Self pollinated tobacco plants for seed production in Mubende District of Buganda Province. *[Information Department Photo]*



PATE XIV

Tobacco grower inspecting his leaf in the curing barn, Mubende District, Buganda Province. *[Information Department Photo]*

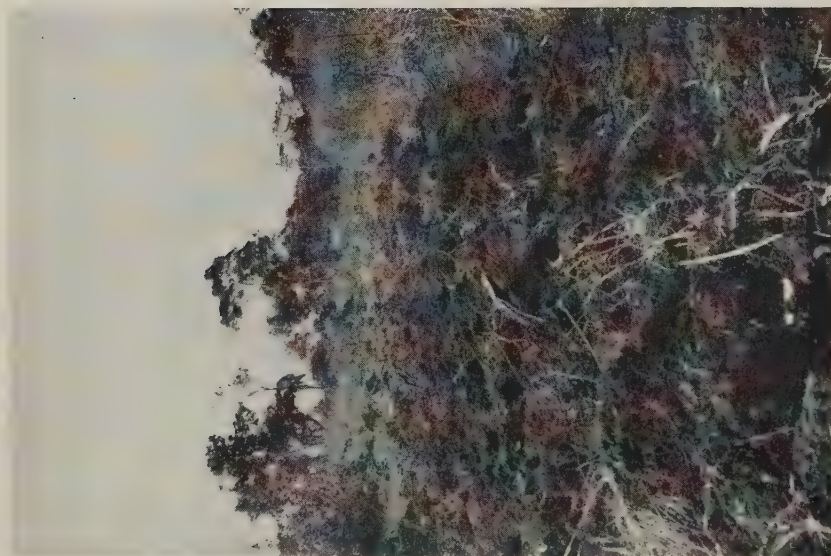


PLATE XV

Typical contract ploughing work in South Kyagwe County of Mengo District. [*Photo by Mr. R. Morton*]



PLATE XVI

Ploughing in South Kyagwe County of Mengo District with International Farmall tractor and semi-mounted plough. [*Photo by Mr. R. Morton*]

V. Annual Report—Northern Province

By G. D. BADGER, *Provincial Agricultural Officer*

A. GENERAL TOPICS

INTRODUCTION

362. The year was marked by the abnormally poor early rains which caused considerable concern for the long-term food prospects. A serious situation was however averted by unusually favourable second rains, and at the end of the year the food position was secured while good crops of tobacco had been harvested, and cotton prospects were promising. The upward trend in the production of economic crops was maintained and development projects made encouraging progress. On the education side the first batch of pupils to leave farm schools since the war did well in their first year in the field. In Karamoja a team of Natural Resources Officers was formed too combat the serious over-grazing and bush encroachment problem in that district.

WEATHER

363. Normal dry season conditions continued until the second week of January when there were widespread storms in West Nile District. The unsettled weather spread to the rest of the province during the third week of the month. Subsequently fairly normal dry season weather was experienced until the last week of March when conditions became progressively more unsettled, but only localised rain fell. In April there was no general rain, although heavy localised falls were recorded. The rainfall pattern was similar in May and June until the middle of July when the second rains commenced. Thereafter heavy and well distributed rains continued into the middle of November. Settled conditions followed and by early December it appeared that the dry season had begun, but in the third week of the month storms were widespread and for the remainder of the year there was an unusual amount of cloud and localised thunderstorms in all areas. Despite the poor first rains total falls were generally well above the average expectation, the Arua station, for an example, recording 75" compared with an average of 54".

SOIL AND WATER CONSERVATION

364. In West Nile there was further improvement in soil conservation measures especially in Jonam and Okoro counties. In the same district a concentrated effort was made to improve soil protection in the Mount Otze area in west Madi. The campaign was well supported by both chiefs and people and a marked improvement in the leaving of grass

strips, gully stopping, and path protection was achieved. In addition certain over-cultivated and eroded areas were closed by the local council. A similar campaign in the Mount Wati area started well but people withdrew their support when forest demarcation commenced. Progress in Lango District was unspectacular but was maintained in all areas except Kioga county where results were disappointing. In Acholi it was felt that the maximum plot width of 35 yards measured down the slope did not give adequate protection and the width was reduced to 30 yards. The revised bye-law was applied as new land was opened. In Karamoja attempts were made to improve an indigenous system of trash bunding practised by the Dodoth people. In Labwor the system of grass wash-stops at 35-yard intervals is firmly established.

AGRICULTURAL EDUCATION

365. The three groups of Aler Farm School pupils, who completed their two-year course of training at the end of 1954, proceeded to the areas they had selected for their farms in Lango District, early in January. The numbers in the groups were seven, six and five and during their first year they opened 27, 30 and 33 acres of land, respectively. In the case of two of the farms heavy bush had to be cleared before opening could commence. The most successful group planted 18 acres of cotton while the others opened 17 and $12\frac{1}{2}$ acres each. With a few exceptions all their crops were well tended and good returns should be obtained from cotton on all three farms. It is early to forecast whether these farms will be successful, but progress to date is distinctly promising. One group is to be congratulated on their good judgment in siting their farm on some of the best land in the district.

366. Of boys who entered Aler Farm School at the beginning of 1954, 11 successfully completed the course, and plan to farm in two groups of five, one boy joining the staff of the school as a field instructor. Assistance was given as in the case of the first batch of boys to leave, each group receiving four oxen free, a grant of Shs. 200 to each individual towards the erection of a house, and a loan of Shs. 2,500, repayable in three years, for the development of the group farm. In addition all pupils who successfully completed the course received a half share of the crops grown on that part of the school farm maintained by them during their training; this amounted to approximately Shs. 500 each. Applications for admittance to the school by far exceeded the 24 vacancies available.

367. The standard of maintenance of the Gulu Farm School continued to improve and by the end of the year six pupils had finished their training. They have selected the site for their farm and will receive assistance for its development and for housing, in addition to a team of four oxen. At Koboko Farm School, four of the 12 pupils completing their training have been appointed to the staff of the school, while the rest plan to work in groups of five and three. The larger group had received the approval of the local council of the site selected for their farm, by the end of the year.

368. The Principals of the three farm schools in the province attended a two-weeks' course at Serere in June. In addition one Instructor from Gulu Farm School commenced a year's course of training in agriculture at the same centre.

369. Short refresher courses of one week duration were held at Ngetta Training Centre for departmental field staff from Lango and Acholi Districts. A similar course for district staff in West Nile was conducted at Abi Farm. The usual cultivators' courses were not, however, held at Ngetta as the buildings at the centre were required for accommodating troops sent to the province in connection with the Sudan emergency.

AGRICULTURAL PROGRESS AND EXTENSION

370. Departmental staff continued to devote an important part of their time to the raising of the standard of cultivation of economic crops. The success of such work can only be judged over a period of years owing to the wide variations in production from year to year caused by the climatic factor. It is however felt that steady but unspectacular progress in this work has been maintained. In addition the production of both flue-cured and air-cured tobacco continued to expand. The apparent drop in cotton acreage in 1955 is thought to be attributable to the closer checks being made on chiefs returns and mean plot size estimation, rather than any serious fall in the acreage sown.

371. Three growers' tobacco curing units operated during the year. The Olili group of growers in West Nile cured their own tobacco for the third year in succession. They grew a total of 20 acres of tobacco from which 4,592 lb. of cured leaf, valued at Shs. 8,960 was produced. The work of curing was carried out by the growers themselves with occasional visits by agricultural staff. The total production by this group was not high, but the progress made is encouraging, in view of the small amount of supervision and outside assistance which was necessary to achieve the result.

372. Following a detailed examination during 1954 of ways and means whereby African tobacco growers could participate in the processing of their crops a small pilot scheme, which will run for two years, was started at Otrevu in West Nile, in 1955. A group of growers, representing some of the most experienced in the district in the production of green leaf for sale to the East African Tobacco Company, took over from the company a two-barn unit at the beginning of the year. Nineteen growers participated and the total acreage established was 20 acres from which 6,233 lb. of graded cured leaf valued at Shs. 11,206 was produced. Close supervision was given both by departmental and East African Tobacco Company staff but it was encouraging that members of the group carried out all operations themselves and had a gross mean return per member of Shs. 583.

373. At Ngai in Lango District, a growers' co-operative society which purchased three curing barns left behind by the East African Tobacco Company, when the company decided to close its leaf production centres

in the district, also made a fairly promising start with growing and curing their own tobacco. Forty-two members of the society planted 19 acres from which 6,498 lb. of cured leaf were sold to the East African Tobacco Company. Insufficient care in controlling temperatures resulted in the almost complete loss of two curings. The final yield per acre, however, averaged 342 lb. of cured saleable leaf. Total proceeds from the sale of leaf amounted to Shs. 10,837. Cash distribution to members based on the number of days worked in growing and curing the crop, totalled Shs. 5,525, and from the balance, Shs. 4,000 of the loan of Shs. 14,476 from the Department of Community Development, was repaid. The society had Shs. 1,312 in hand at the close of the year to meet expenses in 1956, such as transport of firewood and repairs to barns. The planting target for 1956 is 60 acres. The society also produced over 16,000 lb. of cotton and had approximately 120 acres under cultivation for all purposes, including food crops. The key members of the society received training as small-holders at Gulu Farm School before the Second World War.

374. One progressive farmer in Acholi built three new tobacco barns to replace his old barns built in temporary materials. He planted 46 acres of tobacco on his own account and by arrangements with the East African Company purchased green leaf from 14 acres grown by neighbouring farmers. His total sales of cured leaf to the company were 18,931 lb. By the activities of this one farmer Protectorate revenue was enhanced by approximately £7,500 in excise.

375. The demand for mechanical cultivation, chiefly ploughing, early in the season made it necessary to introduce a quota system whereby each group of farmers received an acreage allocation. The total area mechanically cultivated in Lango and Acholi was 2,621 acres of which 2,174 acres were ploughed. 11 tractors were used in the two districts. The full economic price was not charged but it is significant that farmers who have participated in the scheme since the beginning, four years ago, are still enthusiastic. In December it was decided that full economic prices should be paid and accordingly the charges for ploughing were raised to Shs. 50 per acre for 1956. Development of mechanical cultivation has thus reached a critical and interesting stage, for on the decision of farmers whether or not they can afford to pay Shs. 50 per acre must depend whether the tractor has come to stay or not. With regard to prices it is interesting to record that reports have been received of up to Shs. 60 per acre being paid for ox-ploughing.

376. While great importance is attached to the proper exploration of the possibilities of mechanical cultivation, it is felt that much greater use could be made of ox-drawn implements, including ploughs. In this connection demonstration teams of four oxen each based on Aler Farm School in Lango and Abai Farm in West Nile were formed. The ploughing team in West Nile operated near Arua charging Shs. 20 per acre for first ploughing. During the dry season the team was engaged in breaking oxen for the local people. In Lango the equipment of the team included

a ridge plough, cultivator and harrow in addition to a plough. Training of the team had been completed by the end of the rains and demonstrations were given at county shows. This team should be fully operational in 1956. Consideration is being given to the development of similar teams in Acholi during 1956.

377. Surprise may be expressed that Karamoja District should be mentioned here, but substantial progress in the use of the ox-plough has been made there in the last few years. A plough census conducted during the year revealed that no less than 6,297 ploughs were owned compared with 3,786 in 1953 and 995 in 1949.

378. The bush clearing experiment at Alito had a successful year. Of the 50 acres area marked out for clearing, a little over 40 acres was sown to cotton, approximately six acres being under grass wash-stops. The cotton grew extremely well on all parts of the cleared area and unusually high yields are anticipated. The clearing cost of Shs. 126 per acre will be recovered from the farmers participating in three equal instalments commencing in April, 1956.

379. Contract tractor ploughing was again undertaken by the East African Tobacco Company for tobacco growers in Acholi. A total of 132 acres was ploughed.

380. Further testing of spraying with D.D.T. against *Lygus*, on a field scale, was carried out in Lango and Acholi. Both mechanically operated and hand sprayers were used, for which Shs. 45 and 25 per acre respectively were charged. All treated plots were superior to the controls. In one plot in Acholi the spraying produced a most striking effect on the number of bolls set. At the time of writing picking is incomplete but it is estimated that over 1,200 lb. per acre will be produced compared with 600 lb. in the control. The treatments were not replicated. It would appear that substantial increases in yields can be obtained by spraying, particularly where cotton is planted in large fields as is necessary for the economic use of mechanical cultivation. It may well prove essential to spray against *Lygus* in these circumstances.

381. County shows were held at four centres in the province, each district having at least one show, except Karamoja where, owing to political unrest, the show arranged in Bokora county was cancelled. At all shows demonstrations of the main items of propaganda were prepared. Attendances were good and there was an improvement in the standard of exhibits in the agricultural produce classes.

382. Agricultural competitions were held in all districts, with the exception of Karamoja. In Acholi and West Nile shields are awarded for the best division, marks being awarded for cotton cultivation, soil conservation and food crop planting including famine reserves. In Lango, prizes were awarded for the best cultivation groups, judging taking place in each county from muruka level upwards. The judging in these competitions occupies a considerable amount of the time of field staff, but the interest created by the competitions would appear to more than

justify the time spent on them. In West Nile a shield was presented by the East African Tobacco Company to be competed for by air-cured tobacco growing areas, the shield being awarded annually to the division making most progress in the development of air-cured tobacco growing during the year.

PESTS AND DISEASES

383. All cotton for planting in the province was dressed against "Blackarm" for the first time. There was a marked drop in the incidence of the disease as measured by stem lesions. Counts made in Acholi indicated that main stem lesions had been reduced from the normal 50% to 5%.

384. A bacterial disease of tobacco seedlings, which appeared to be systemic, destroyed seedlings in 275 beds in the Gulu area. The disease has not been reported from other tobacco growing areas and is still under investigation.

385. Cassava scale became widespread in Acholi, the pest having been reported in the Gulu area and a number of places in east Acholi.

386. No locust movements were reported until May when a large flying swarm of Desert Locust of approximately seven square miles in area was seen in Acholi travelling in a north-easterly direction. Isolated specimens were found in Karamoja and West Nile in the same month. No further reports were received until October when single swarms were seen in Lango and Acholi. In November there was a general increase in locust activity and reports of several large swarms were received from each district in the province. Considerable localised damage was caused to food crops and cotton in Acholi and to late finger millet in West Nile. In December the only report came from West Nile where a medium sized swarm was seen.

EXPERIMENT STATIONS

387. Owing to the opposition of the local people it was not possible to commence demarcation of the proposed new farm for Acholi District at Labora. It is hoped that the allocation of 200 acres to the department will be made early in 1956. In addition to its functions as a district experiment farm and tobacco experiment centre, the farm will be used for testing machinery and trials for extending the use of ox-drawn implements.

388. The two main experiment farms at Ngetta and Abi were maintained as hitherto, with only one major change in the experiment programme at Ngetta. Following the long term grazing trials, comparing the effects on subsequent crop growth of natural regeneration and a seeded pasture when grazed and ungrazed, it was decided that the possibility of transferring fertility from rough grazing to cultivated land should be tested. In the new series of trials night paddocking will be compared with day grazing, the effects on fertility being measured by

subsequent crop yields. The animals will spend from 6 p.m. to 6 a.m. in the night paddocks, while in the other grazed treatments grazing during the day only will be permitted. The control treatment will be no grazing.

389. Cotton variety trials were conducted at four centres in addition to Ngetta, while on the small farm at Zombo, serving the West Nile highlands, seed beds of nine varieties of coffee were planted with a view to laying down replicated variety trials.

ANIMAL HUSBANDRY AND PASTURE WORK

390. Breeding herds were maintained on departmental farms at Ngetta and Abi, while the Moroto herd belonging to the Karamoja Local Government continued to be in charge of departmental staff.

391. At Ngetta it was decided to discontinue the range herd, it being felt that the experiment had fulfilled its purpose, having shown that calves can be run successfully with their dams throughout the day and merely housed separately at night. The herd was sold to the Bunyoro Agricultural Company. At the end of the year there were 139 cattle on the farm. Calf losses were rather higher than usual, deaths amounting to 14.7% of all (34) calves born.

392. At Abi the policy of breeding from the large Alur type cattle was continued and the herd culled accordingly. Breeding stock was purchased from the West Nile highlands in replacement of animals sold. In Karamoja the Moroto dairy herd produced 11,283 pints of milk, the average number of cows in milk being 32. The herd bull was replaced by a Boran bull from Kenya.

393. In Karamoja the Irii Grazing Trial, which is situated in the dry season grazing grounds, produced what may be an important negative finding. Owing to stock losses through the unidentified "Irii Disease" it was found impossible to apply the grazing treatments fully, which tends to support the contention of the Karamojong that cattle will not thrive if kept permanently in the dry season grazing areas. Clearly, further experimentation must be done to supply the answer to this question in the event of it being necessary to consider permanent occupation of grazing areas which at present are only utilised in the dry weather. With this object in view, a new herd of local cattle will be introduced to the trial in 1956.

394. Owing to the indifferent early rains, grass growth in the Cholol and Koloswa thorn scrub eradication trials was very poor compared with 1954 and no burning or grazing was possible. As in previous seasons the best grass cover has been re-established in the stumping and burning treatments. This finding is, however, of little value for extension purposes in view of the high cost of stumping and the slow rate of recovery. It must, however, be stressed that the trials are situated in an area of dense thorn scrub.

395. The 1954 trials, laid down to test methods of eradicating bush and restoring a stable grass cover in the wet season grazing grounds of Karamoja, were maintained according to plan. The findings to date indicate that re-seeding bare grounds is only effective when the land is ploughed. Ploughing, provided it is done along the contour, does not cause erosion and water absorption is increased. Ploughing has also been found to increase the establishment of other species without seeding. It is disappointing that in most cases the dominants have been annuals, but on some trials perennial species, in addition to those planted, are establishing themselves. Bush regeneration has occurred wherever stumping has been done but regeneration is slight where ploughing has been carried out as well.

396. In Lango paddocking continued to interest some of the more progressive cattle owners, chiefly, it is thought, owing to the difficulty of obtaining herds and the heavy fines imposed for damage to crops. The area enclosed during the year was 517 acres which included one exceptionally large enclosure of 400 acres. The paddocks vary in size from half an acre to 30 acres, with the exception mentioned above. The total number is 81. All enclosures were approved by the local councils before fencing began.

397. The two dairy schemes which were started at Agwata and Icheme in 1954 for producing milk for sale in Lira Township continued to operate successfully and 19,050 gallons of milk were sold during the year through the African Local Government Dairy.

IRRIGATION AND SWAMP RECLAMATION

398. The indigenous irrigation system at Agoro, Paloga and Pamaa in east Acholi were extended considerably during the year; it is estimated that approximately 300 acres were under irrigation. The main planting was sweet potatoes which, besides producing food, is an important source of planting material.

399. The Namalu permanent irrigation scheme at the foot of Mount Debasien was maintained without extending the acreage under cultivation. The main crops grown were rice, groundnuts and finger millet. The following yields per acre were recorded:—

Rice (paddy)	..	..	1,843 lb.
Groundnuts (unshelled)	..	..	977 lb.
Finger millet (threshed)	..	..	305 lb.

400. The finger millet suffered from bird damage. A wide range of European vegetables was also grown.

401. The Nadunget flood irrigation scheme in Karamoja, after suffering from too much flood water in 1954, produced very poor crops owing to the failure of the early rains in 1955. It has been decided to abandon the scheme and hand over the area to the Natural Resources section of the District Team for work on grass seed production in connection with rehabilitation work.

402. The flood irrigation scheme at Ngiminio, which has done consistently better than Nadunget in the past, had a much more successful year. Twenty-four people rented plots and flooding was well distributed and yields good. The best yield from departmental plots was the K.8 maize variety which produced 3,429 lb. of dried cobs per acre, while up to 2,480 lb. of threshed grain per acre was recorded for the sorghum variety "Liba". Finger millet was, however, well below average, the yield being only 392 lb. per acre of threshed grain.

LIAISON WITH LOCAL GOVERNMENTS

403. African Local Governments co-operated well in all aspects of agricultural work. A good example of this co-operation is to be seen in the land and the very considerable sums of money made available by the Lango African Local Government for the development of Aler Farm School and also in the support and assistance given to successful pupils in establishing their holdings.

404. In general, agricultural bye-laws were applied wisely, the aim being to deal with the worst offenders and restrict the number of cases taken to a minimum.

NON-AFRICAN AGRICULTURE

405. In West Nile, which is the only district where farming is carried on by non-natives, Messrs. Busby Brothers had an excellent early crop of flue-cured tobacco, but unfortunately their second crop was practically wiped out by hail. In all, 40,000 lb. of saleable leaf were sold from the two crops. Messrs. Sthankiya Brothers hope to produce 15 tons (parchment) of arabica coffee from the 1955 crop on their Nakulu estate. This firm also planted a trial plot of air-cured tobacco from which they sold 1,000 lb. of cured leaf.

B. FOOD CROPS

FINGER MILLET

406. Germination of the usual dry sowings was delayed and a considerable amount of re-sowing was rendered necessary by dry spells. The final acreage was about normal, but yields were everywhere below average. A small autumn crop in West Nile produced excellent yields.

SORGHUM

407. The poor early rains affected ratooned sorghum seriously and yields were unusually low. The interplantings with finger millet yielded better than the latter crop by virtue of its longer growth period, which enabled it to take advantage of the good second rains. The acreage planted in pure stand, although smaller than usual, produced good yields, particularly in Acholi. In Karamoja rainfall was inadequate for planting and growth of the crop. The acreage sown was estimated at half that of last year and yields were poor.

PIGEON PEAS

408. This crop was checked by the lack of rain early in the year but later recovered with the advent of favourable weather and the final yields were high in all parts where it is grown.

BEANS

409. The year proved very unfavourable for beans, the early crop suffering from lack of rain and the late, which is the main crop, from excessive rain. Very poor crops were harvested and the acreage planted was less than usual.

GROUNDNUTS

410. There was an increase in the area planted in West Nile, but generally the development of this crop was disappointing in view of its popularity as a food and the fact that it grows well in many parts of the province. Lifting is, however, difficult except on the lightest soils.

SIMSIM

411. The main crop, which is planted in the second rains, grew well and yields were average to above average. A particularly good crop was reaped in east Acholi. There is unlikely to be any marketable surplus.

SWEET POTATOES

412. The acreage planted exceeded that of last year in all districts except Lango. The main crop yielded well and a good area of swamp and valley planting was established.

CASSAVA

413. There was a good carry-over from 1954 and satisfactory acreages were planted in 1955. All plantings grew well and yields were high.

GENERAL FOOD POSITION AND PROSPECTS

414. The carry-over of grain to 1956 will be considerably less than in 1955, but there are good reserves of root crops and other foods, such as simsim and pigeon peas. In Karamoja it will be necessary for people to supplement their grain supplies with purchases of maize meal through normal trade channels. Apart from local shortages, food supplies should suffice until the 1956 harvests are ready, provided the early rains are not unduly delayed.

C. ECONOMIC CROPS

COTTON—1954/55 SEASON

415. Marketing opened in the West Nile Zone on 3rd January, buying having started elsewhere in the province in December. The prices paid were 60 cents per lb. for "safi" and 23 cents for "fifi", except in West Nile zone where 26 cents per lb. was paid for "fifi". During the first two

weeks of January buying proceeded extremely smoothly, but unusually wet weather in the second half of the month caused difficulty with grade and considerable losses in the field where picking was neglected. Dry weather in February brought about a rapid improvement in grade. Buying was completed by 26th March in Lango and Acholi, but in West Nile it was necessary to extend the season until 10th April. The total output for the province, including Kumam, was 31,363 tons of seed cotton, which is the third largest crop so far produced. In West Nile zone the estimated production in bales was 9,069 which means that the zone failed by 831 bales to exceed the scheduled crop by 2,400 bales in two successive seasons.

416. Co-operative marketing continued to develop. The most significant increase was in the West Nile zone where the percentage of the total crop handled by societies rose to 13.6%.

417. Cotton observers worked at all buying points in the four zones. The effectiveness of these men varied greatly but in general they did useful work in protecting the interests of the seller.

418. During the season five new cotton markets operated for the first time. These additional marketing facilities represented the maximum that local building resources could provide rather than the full requirement which was far in excess of the number built.

COTTON.—1955/56 SEASON

419. Lack of rain hampered the opening of new land for planting in many areas until the last week of June. Many growers planted their early cotton on previously cultivated land rather than waiting for sufficient rain to open new land. The good rains in July and August enabled opening and planting to proceed rapidly and large acreages amounting to 74% of the total crop were planted in these two months. Growing conditions remained very favourable in September and October and all plantings grew well. In November the crop was healthy and yield prospects high. It was, however, feared that a sudden onset of the dry season might cause a rapid fall in prospects in view of the fact that most of the crop had experienced no marked dry spell to cause it to root deeply and also that much of it had tended to produce excessive vegetative growth. In the event, the rains decreased gradually and no serious boll shedding occurred. Prospects at the close of the year were good in all zones and the crop estimate stood at 65,000 bales compared with the record crop of 70,638 bales grown in the 1951/52 season.

COFFEE

420. Growers in the West Nile highlands continued to show increasing interest in their arabica crop. Sales from the 1954/55 crop amounted to 4,670 lb. of rough hulled coffee. It is estimated that approximately 56 acres were planted in 1955 and that the total area under the crop was 389 acres. During the year a large hand pulper was installed

at Paida and it is estimated that approximately 30% of the 1955/56 crop will be sold as parchment. A total crop of three tons of rough hulled coffee is expected. The number of seedlings in nurseries at the end of the year for distribution in 1956 was 75,000.

421. Robusta coffee nurseries were established in the middle altitudes of West Nile with a view to providing an economic crop in those areas which are not served by tobacco or arabica coffee. Eight nurseries were started and at the end of the year there were 15,000 seedlings in nurseries for distribution in 1956. The number of seedlings raised was considerably reduced by thefts.

TOBACCO

Air-cured

422. Transplanting of the West Nile crop commenced in April and continued until the first week of June. Dry weather, particularly in May, checked the young crop and reduced the area planted. At the end of June a poor crop seemed inevitable but, with the onset of the second rains, all plantings made a good recovery. Harvesting commenced in July. Marketing opened on 11th October and the total quantity sold was 597,449 lb., of which quantity 425,303 lb. was Grade I. Thus, after a most unpromising start a record crop was produced, the previous highest being 343,747 lb. in 1954. The acreage planted was 1,198 compared with 1,285 acres in 1954 and the average yield per acre of cured leaf was 499 lb. The variety grown was Heavy Western. Very favourable reports were received from the East African Tobacco Company on the quality of the leaf sold. The prices paid were Sh. 1 per lb. for Grade I and 70 cents for Grade II. The total value of the crop to the grower was £27,290.

423. At the beginning of the year arrangements were made for the production of selfed seed of Heavy Western from selected plants at Abi Farm to replace the old method whereby seed for issue to growers was collected from open pollinated plants in private plots. 53 lb. of seed were produced at Abi in addition to seed collected from private plots.

424. During the year the East African Tobacco Company made available a member of their European staff to assist with field work in the air-cured tobacco growing areas of West Nile. The closer supervision which this additional staff permitted undoubtedly contributed to the marked increase in production, particularly in Maracha county where most progress was made.

Flue-cured

425. In West Nile, despite the unfavourable weather in the first half of the year, a record crop of just over half a million pounds of cured leaf was produced. As in previous years both early and late crops were planted. The early crop was checked by dry weather but once the second rains broke it made a rapid recovery and produced excellent yields of high quality. The second crop was less satisfactory owing to the excessive rains and yields were considerably lower. The total acreage of the two

crops was 1,657 acres, and 4,231,202 lb. of green leaf were purchased from growers. The prices paid were 10, 8 and 3 cents per lb. for the three grades. The total value to the grower excluding payments to Olili and Otrevu groups was £17,711.

426. In Acholi no second crop was grown, transplanting taking place as far as possible at fortnightly intervals from April to late July. As in West Nile, the unfavourable early rains checked growth and reduced stands but with the advent of good rains the crop came away well. Unfortunately the difficult planting season had the effect of reducing the intervals between plantings and this, coupled with good yields, produced green leaf in excess of the available barn space and considerable wastage occurred. Harvesting and curing were completed in October. Total purchases of leaf by the East African Tobacco Company were 2,128,710 lb. from which 245,585 lb. of cured leaf were produced. The total acreage planted was 942 and, allowing for 42 acres destroyed by hail, the yield of cured leaf was 272 lb. per acre, which is the highest so far recorded in Acholi.

MISCELLANEOUS CROPS

427. Sales of sunflower seed in West Nile were again disappointing, 100 tons being sold compared with 91 tons in 1954 and 289 tons in 1953.

428. In West Nile 8,400 lb. of undried chillies were purchased. Previously sales of this crop were negligible. Favourable reports on the quality of crop were received.

429. In Lango 13 tons of shea butternuts valued at £153 were purchased.

VI. Annual Report—Special Development Section

By A. D. LLEWELLYN JONES, *Chief Agricultural Development Officer*

GENERAL

430. The most important event in this section during 1955 was the departure of the Assistant Director of Agriculture (Special Development), Mr. R. K. Kerkham, O.B.E. in July. Mr. Kerkham had had charge of the section for five years, and led a small band of enthusiasts of mechanisation with the greatest sense of purpose. Mr. Kerkham was a "farmer" both by training and by upbringing, and to all the work of the section he brought that moral sense of values with regard to land usage and cropping that only the genuine farmer can bring. To him, rightly, mechanisation was only another way of getting the job done, and he never lost sight of the real purpose of his efforts. How best to improve the farming methods of Africans to promote their wealth, without prejudicing the land for future use.

431. A devoted servant of Uganda, and a most inspiring leader to those with whom he worked in close association, there are many people who wish they could turn to him now for sage advice. It is idle to pretend that the section can be imbued with the same inspiration again. The honour of the O.B.E. accorded to him in the New Year's Honours List of 1956 is a recognition of his personal contribution to agriculture in Uganda, and a source of pride to those persons with whom of later years his work was most closely associated.

432. With the departure of Mr. Kerkham there has been a significant change of emphasis. The section is now concentrating on its mechanical aspects with a view to their efficiency and costs, and must now fit its methods into the farming plan as arranged by agricultural policy in the various provinces.

433. Care will have to be taken that the section does not develop an undue predilection for mechanisation for its own sake, estranged from the realities of farming. In some respects the fact that the section has to farm on small farms of its own is of assistance, and with the development of the Agronomy Section there should be ample opportunity for fusing mechanisation into the farming system without forming an entity unto itself.

434. It has been forcibly demonstrated on many occasions during 1955 that mechanisation in some areas now forms an integral part of the economy, and that the withdrawal of the contract hire services would cause economic and social distress. To obviate this, and to create an alternative in which corporate or personal possession of equipment is encouraged, has been one of the main directions of policy in the year.

MAIN TRENDS

435. Of the two previous development farms only one, the Bunyoro Agricultural Company, near Masindi, has continued in its original concept. Busoga Farms, as an entity, was closed down in 1954. Attempts have since been made to convert this cleared and valuable area into a Tenant Farmer Scheme in which tenants can enjoy the advantages of mechanisation. A small area was retained as a proving farm. However, the customary system of land tenure practised in Busoga has made resettlement very difficult.

436. The Tenant Scheme at Kigumba shows distinct promise if the basic economics can be brought to balance. Here, as elsewhere, the real trouble is to find crops that will in their selling price justify either costly operations in minimum or a multiplicity of such operations. Considerable information and experience has now been obtained, and in some respects the future is encouraging.

437. Contract hire services operated in Buganda, Busoga, Bunyoro, Toro and Acholi/Lango. Work was sporadic and unpredictable and comparisons of efficiency are complicated both by environmental complications and by lack of standardisation in equipment for part of the year. Buganda and Busoga remain the most difficult, both being topographically intractable, and with a very low factor of aggregation. It had been Mr. Kerkham's policy to promote aggregation by a sliding scale of hire rates, but there is little evidence to show that this has caused any major change in the last three years.

438. Spraying of *lygus* in cotton having become a practical possibility, the section took over the hiring of equipment at fixed charges in Bunyoro and Lango/Acholi.

439. Apart from providing some funds, ox ploughing is no longer a responsibility of the section. In future, ox training and use will be stimulated on a provincial basis on the normal departmental side. Work with oxen does proceed however on farms that come under the section, and investigation of new machinery and its possible development is certainly its responsibility.

STAFF

440. The Assistant Director of Agriculture (Special Development) was in charge of the section until July 1955. With the appointment of a new officer, the title was changed to Chief Agricultural Development Officer. The Agricultural Engineer was based at Kawanda, and was largely concerned with records and costs. For his own experience, he also had charge of the small farm at Senge. It is very salutary that specialist staff also have responsibility for practical farming.

441. A Senior Field Officer had general charge of operations in Buganda, but was relieved of direct hire contract work when a new officer arrived in November. Early in 1956 he will also be disemburdened to the extent of having office assistance. This will enable him to concentrate on technical matters and to prepare for his eventual position of Instructor to the Tractor Training School.

442. Field Officers were also in charge of Base Workshops, Bunyoro Contract Services, Toro, Busoga Farms Resettlement and Contract Services, Acholi, and Lango. A further Field Officer had general charge of activities at the new headquarters at Namalere, where various buidings are proceeding.

443. Of the above, four are fresh from the United Kingdom in November, as a result of a successful recruiting drive by the Director. Housing a sudden influx of staff has been the cause of some anxiety and considerable self help. The position is now fairly well assured.

THE ECONOMICS OF MECHANISATION ON AFRICAN FARMING

444. This section loses a great deal of its value because of the paucity of reliable facts. The growth of specialised sections has outpaced the assessment of them, and in a highly competitive and evolutionary market basic economic data is vital.

445. It is difficult to assess the value of mechanisation to the farmer, as little evidence is as yet in tangible form as to the amount that Africans are willing to pay, possibly from capital or more lucrative sources, for sheer freedom from physical exertion. Housewives who buy washing machines seldom justify their capital outlay by taking in the neighbour's washing, and it is thought that many Africans, particularly in the Buganda areas adjacent to urban concentrations, are employing mechanisation without calculating the cost in production per acre, either short or long term. In the Masaka region, Africans have taken the long term view of mechanisation costs in relation to coffee, and provided money from capital against a possible high return in four or five years. In the Mityana areas, many Africans have already suffered considerable losses in growing maize, and there is now a cautious approach to tractor usage. Prices and prospects of the previous year being taken as the criterion for the present, there is usually a heavy demand every other year. Maize growing in this area acts as a catalyst on the cotton acreage, and in 1955 the results are not encouraging.

446. Operations in Toro are confined to the Busongora area, where Bakonjo descend from the mountain to grow cotton on the amenable soils of the plains. The area is compact and crops grow well. Provided game does not do undue damage, it is probable that mechanisation pays for the short time of the year that it is employed. However, the concentration of this is confined to about four months of the year, and the service is left to cover impossible overheads for the rest of the time. Provided obsolescence is not a vital factor and equipment can be maintained in good condition for twice the normal period of depreciation, this area can probably make mechanisation pay. The position is, however, complicated by the instability of the social complex, and the advent of mechanisation may accentuate this. The Bakonjo have not, as yet taken to permanent settlement on the plains. Like the urban population of the larger towns in Uganda they live in two places and cannot therefore devote all their energies to either. There are signs that some of the younger sons may take up permanent residence.

447. In Bunyoro, high dispersal of plots and small areas in themselves has made contract work most difficult. There was also a mixed group of equipment, making standards of comparison impossible. The tendency has certainly been to remove the drudgery out of work without increasing the production per acre or per person. Even with mechanisation the area per person in co-operatives has only averaged one acre. This makes a balanced economy quite impossible, and it is clear that the true functions of mechanisation are not appreciated. Equipment has now been standardised, with some saving in time and costs to the section, but a great deal of work is now necessary to persuade the farmer that timely planting with good seed, fields kept clean and more work on a greater acreage might provide the means of restoring to Bunyoro the source of capital they lost when their herds of cattle were destroyed in about 1906.

448. Lango and Acholi are grouped as they were run on a common basis by one Field Officer until November, when he was joined by an assistant to look after Lango. Traditionally, these areas enjoy communal effort, and the land pattern is such that areas for work are well concentrated. Crops, with the exception of cotton, are of low value, and the local farmers are astute enough to realise that the number of operations for which they have to pay must be related to the yield in shillings per acre. In general, therefore, not more than two operations are performed, and the total investment in mechanical work seldom comes to more than half of the normal yield. With successful spraying of cotton for *Lygus*, the return per acre of this crop could take a rapid rise, always provided the elimination of one entomological problem by the use of an insecticide does not aggravate or stimulate another. Mechanisation is entirely confined to pre-seeding operations, with the one exception that there has been some demand for ridge weeding of flue-cured tobacco. This indicates a capacity for hand harvesting of crops, and clearly shows that crops can only be harvested in total when all the family are devoted to the common objective. The operations performed in comparative percentages make an interesting table.

Acholi Crop	Acres	Percentage
		<i>All approx.</i>
Cotton	358	46.0
Tobacco	45	5.7
Cotton followed by tobacco ..	30	3.8
Simsim	158	20.3
Groundnuts	30.5	3.8
Groundnuts followed by beans ..	6	.86
Beans	33.5	3.9
Maize	3.5	.4
Sweet Potatoes	7.5	.9
Cassava	10	1.3
Finger millet	47.5	5.8
Rice	.5	.1
Finger millet followed by cow peas	17.5	2.2
Sorghum	31	3.8
TOTAL ..	778.5	

The significant trend in this is that the recognised cash crops only form 55.5% of the mechanically cultivated land. This is a decrease of 10% over 1954, and indicates that in areas where populations are rapidly growing mechanisation is becoming entrenched in the subsistence of the people.

449. In Lango the percentage figures are not so high, but the tendency is even more marked. Out of a total of 371.5 acres, 75.5% was mechanically cultivated for cash crops. This is a decrease of 12% on 1954. In both areas, therefore, there has been a significant recognition of the cash value of food.

450. In Busoga the tractor hire service has been working on a limited scale only. Eighty-five per cent of the work done was on plots of three acres and under, and although this is the first year of operation the future seems obscure. There has been no movement of any kind towards aggregation, even to take advantage of the reduced rates for larger acreages. The Ikulwe area is one of cash shortage, and there is no co-operative. It may be that the hire service is unjustified in these conditions, and it will certainly have to be withdrawn if there is no real settlement on the old farm land. The Basoga remain an individualistic people, whose standard of farming in some respects is of a high order. Their strong conservatism is rooted in their seeming lack of ambition.

451. It is clear, therefore, that a great deal more information is required before conclusions can be drawn. A common standard of records other than those of pure tractor work must be evolved, and more information obtained as to the economic pattern now being evolved in areas where demand is high.

452. This work will need to be done in association with a Specialist Economist to co-ordinate and direct the work.

MACHINERY SUITABILITY

453. It is inevitable that the section has accumulated a great deal of machinery over a period of five years. In 1955 it was decided to standardise and simplify as far as possible and to take steps to dispose of old and surplus equipment. This latter project has not yet been completed but the process of standardisation is almost complete.

454. It is clear that the requirements of a contract service are not exactly similar to those of the private owner. We have fixed overheads and variable degrees of training. We have, therefore, aimed at the elimination of items of equipment that are the most usual source of trouble.

(a) The replacements of conventional coil ignition on all tractors with magnetos. This eliminates starter, battery, automatic voltage control, coil dynamo, and many feet of wire. The tractor must then be started by hand.

(b) The replacement of diesel tractor by kerosene or petrol. Until some method is evolved of keeping diesel clean when moved round

in small quantities to dispersed tractors, the future of diesel tractors is not promising. Manufacturers could help by fitting a more comprehensive system of filtration. Costs of running diesels are very low until the major overhaul stage is reached, then replacement parts particularly of injection apparatus are apt to be very expensive. The compression ratio being so high, it is essential to have battery-assisted starting. This means more complications, and batteries for diesels are usually large and expensive. British manufacturers seem very reluctant to fit an efficient inertia starter to this type.

(c) Each district is now standardised for all its equipment. This makes spare parts and repair much easier. The section now operates only two types of equipment on hire service.

(d) The elimination of equipment that has proved expensive to operate.

455. Whilst it is expedient to simplify equipment for tractor hire services, the development of new machinery is not forgotten. The section purchases and tests various types of equipment, and this includes diesel types. It is hoped that the establishment of the N.I.A.E. in East Africa will provide basic data on equipment, in conditions which bring in the main climatic differences of humidity, altitude and temperature from the standard United Kingdom tests. These must be in conjunction with field tests of which some of the technique is already known.

456. In the areas adjacent to the large towns it has been found to be advisable to use kerosene tractors not petrol. A great many lamps can be lit for a gallon of kerosene, but a gallon of petrol goes nowhere when put into a modern American car.

457. Perhaps the most urgent necessity in 1956 is the investigation of small types of equipment requiring low capital. There has been considerable development of these in Europe, particularly in Germany, and some of the new machines may have an important function to play in Uganda.

458. The real obstacle to progress is not the provision of machinery but the technical knowledge of the users. It cannot be denied that the African farmer has a great deal to learn before he can use agricultural equipment satisfactorily. The motor vehicle is still handled by many in the most incredible way, and the records of the section are full of purchasers of equipment who, having used up valuable capital to buy expensive machines, let it go derelict in the second year. Many parts of Uganda, particularly in Buganda, have equipment overgrown with weeds because of the sheer lack of technical skill. An expensive track layer did without oil for some time, then protested in the most violent way: the cost of repair is beyond the capability of the owner. Small rotovators are left in long grass, on many farms, as the skill and effort required to use them was not available and in desperation labour had driven them into the nearest obstacle knowing very well that the owner would not be seriously perturbed at his loss.

459. The proposed Tractor Training School at Namalere is designed to assist potential owners of their own equipment or their direct operators. When the cycle repairer of the village can extend his operations to include the repairs of agricultural equipment there may be a better future than at present.

TRAINING OF OPERATORS AND MECHANICS

460. There has been an encouraging increase in the basic skill of both the above categories, but the comparative degree of skill is still well below the satisfactory level. Tractor drivers, in many cases, are adept at steering the tractor through its various requirements, but lamentably bad at adjusting the implement to the varying conditions. Although this is a matter of internal training, it also pre-supposes that the operator himself has some knowledge of farming, but this is notably lacking from our driving personnel. A normal recruit considers he knows all that is required after a fortnight. It is this smug satisfaction with contemporary low standards in everything that is the main trouble.

461. Mechanics are proving much more able to cope with their commitments. The practice of training a number in the main workshops under the Field Officer (Mechanic) is right, and these are then available for distribution to main centres. Tribal associations are not always easy. Baganda mechanics sometimes object to going to the Northern Province, and vice versa. With the higher standards of training that will be achieved by the Kampala Technical Institute, the source of these potential skilled workers should improve.

INVESTIGATIONAL FARMS

462. The section has an interest in five small farms:—

Senge.
Butasindirwa.
Kagongo.
Namalere.
Busoga Farms—Ikulwe.

SENGE

463. This farm represents an experiment to see if farming on a small scale in Buganda and utilising mechanisation can pay. The farm is run directly by Africans, including management. The basic economy is ten acres of cotton, five early and five late. The labour is based on this, and other crops are grown to the best advantage without aggravating this labour. Thus, a rotation is evolved annually in which cotton is inviolate. Maize fits in well, harvesting being easy and cheap. But there is some difficulty in getting other crops with economic values. Groundnuts grow well, provided the stand is good enough to eliminate Rosette, and that harvesting time is dry. Beans grow well but the return per acre is very low. Sunflower and soya beans which have been grown provide

difficulties. Sunflowers depress the yield of subsequent crops, are susceptible to damage by birds, and do not sell well. Soya beans grow well but the cost of harvesting is prohibitive. The whole project so far demonstrates quite clearly that Uganda urgently needs additional cash crops to cotton and coffee.

464. Conclusions at the moment would be indefinite, but there does seem hope that an alternative is to use meat and milk as a cash crop. Cattle do not exactly thrive, but being adjacent to a highly concentrated area the milk available finds a ready sale. More original and more promising is the conversion of second grade foods with some supplementaries into pork. So far this looks attractive. Apart from internal production on the farm, Shs. 2,029 was spent on external food purchases. This includes protein and minerals. The value of pork sold was Shs. 3,824, and the 32 pigs left in their present state of growth are valued at Shs. 3,000. Of the farm production consumed by the pigs some at least would have been useless for sale and would have gone to waste. The estimated value of the balance is Shs. 4,000. It looks, therefore, as if the project at this stage is in balance. The investigation continues.

BUTASINDIRWA

465. This small farm acts as a cushion for tractor hire services provided in the area. Equipment not actually out to hire, is used on the farm. The conception being to see if an uneconomic hire service can be made economic by allying the service to a small well run productive farm. So far, the answer is that the farm, whilst being in balance in itself, has made no contribution to the hire service costs, except insofar as the skill of employees has been utilised and extended on the farm itself.

466. Cattle have done well, but the costings have been obscured by seasonal moves owing to water shortages. A borehole is scheduled for the area in January 1956.

467. Very good crops of maize, groundnuts and sunflower have been grown, but in no case has the yield in shillings per acre been sufficient to make any contribution to the overheads of the hire service. Cotton has varied, but in 1955 the crop was fair.

Season	Crop	Acreage	Yield
1955 ..	Soya beans ..	4.25	1,656 lb.
	Groundnuts ..	4.25	2,911 lb.
	Maize ..	4.25	10,000 lb.
	Banja beans ..	4.25	577 lb.
	Cotton ..	7.25	Not yet harvested.
1954/55 Crops ..	Soya beans ..	4.25	723 (Not valued)
	Cotton ..	8.50	6,126 lb. Unsorted.

Little work has been done to find a second valuable cash crop, but investigation of this will take place in 1956.

KAGONGO

468. This was a part of pasture research in the past and was proved unsuitable for food crops. It has an excess of manganese and would grow tea well, but it may be too far and too small an acreage. It represents a drag on the resources of the section and has played no significant part in the work. The dominant grass *Cymbopogon afronardus* has not been conquered by mechanical means and remains the main problem of the area.

469. It is in the centre of a good growing area for maize, and farmers using the tractors base their economy on this crop.

NAMALERE

470. This is the site of the new headquarters of the section, the main base, and the location of the new Tractor Drivers' Training School; all due to be built during 1956.

471. It has 25 acres of mature robusta coffee and 75 acres of eucalyptus. The coffee is run on the same basis as the previous owner organised it. By heavy mulching and careful handling the crop has been well-maintained, 7,560 lb. of coffee being produced in 1955. Some of the area may be used for experimentation by the research staff, but in the main the economy of the farm is being maintained. The section may be involved in the processing of coffee. There seems to be some necessity for the establishment of a small coffee processing factory that could be emulated by African growers.

472. The cattle on this farm will have to be dispersed to other areas as the grazing is deplorable. An exercise in the mechanical recovery of grazing may be possible.

BUSOGA FARMS

473. Seventy acres of the old farm were retained when the scheme was concluded in 1954. The farm is run on the same general basis as Senge, but has struck economic difficulties of a serious nature. Cotton in 1955 being badly affected by *Lygus*, no other crop has been grown that shows an economic return. Maize grows very well, but the invasion of pig and elephant at regular intervals play havoc. Soya beans grow well, but it has been found impossible to harvest them. Sunflowers are consumed by birds, and both millet and sorghum have limited markets.

474. From all the above it could be fairly adduced that the most difficult problem confronting the section is similar to that of the African. Other than cotton what else can be grown that gives a fair return of shillings per acre? This problem is urgent, and increasingly so until the price of food makes it valuable as a cash crop as has happened already with "matoke".

TRACTOR WORK ON THE FARMS

475. A considerable amount of work is done on the farms by the section's tractors. This work is charged against the farms at the rate of Shs. 20 per hour, since it is mainly transport.

476. In an effort to cut down this expense more use is being made of ox carts for the transport of such things as water, etc.

477. Details are given below:—

				hours
Senge	..	..	..	358·75
Butasindirwa	..	..	..	474·75
Kagongo	..	..	..	607·00
Busoga Farms	..	..	..	241·50
Namalere	..	..	..	251·25
Headquarters	..	..	..	76·50
TOTAL				2,009·75

TRACTOR HIRE SERVICES

478. The total revenue earned in the Mengo District was Shs. 38,855. The production of a true balance sheet between revenue and expenses in Mengo is difficult, as the tractor hire service records are confounded with base and workshops costs. Steps have been taken to see that in future the true operating costs are available.

AGRICULTURAL OPERATIONS (CONTRACT WORK ONLY)

Area	Ploughing		2nd Operations		Planting		Weeding/ Ridging		Grdg. & Tpt.
	Hrs.	Acres	Hrs.	Acres	Hrs.	Acres	Hrs.	Acres	Hrs.
Kyadondo ..	620	233	6	11	5	5	2	1	59
South Kyagwe ..	673	315	123	80	28	27	12	6	158
Singo ..	1,009	468	74	49	151	133	12	5	34
Bulemezi ..	433	190	—	—	54	40	—	—	—
Masaka ..	592	185	—	—	—	—	—	—	—
TOTAL ..	3,327	1,371	203	140	238	205	26	12	251

479. It is not envisaged that extensive expansion of the hire service will be made in Buganda. The training school should enable private owners to buy equipment without undue qualms. There is some case for using mechanisation in a new area rapidly being developed, such as south Bugerere, and discussions about this will proceed.

480. Transport involved between work is again a major cause of high costs. Net ploughing time for the tractor is 1·7 hrs. per acre. But the total allocated time due to transport is 2·03 h.p.a.

TORO

481. This scheme is only really starting, and there is more work to do on farm planning, housing, provisioning of water, soil conservation and balanced agriculture than there is with mechanisation. The Field Officer has been largely concerned with all these projects in association with the Agricultural Officer. Equipment was confined to two tractor units, but this is being increased to five.

482. Total revenue earned for the year was Shs. 20,273. The operations done:—

Operation	Total hrs.	Total acres	Hrs. per acre
Ploughing	912	351	2·60
Tilling	464	306	1·52
Transport (hired) . .	101	—	—
Transport (operational, i.e. for ploughing) . .	142	—	—
TOTAL . .	1,619		

483. The large number of hours charged as an overhead (142 hours) was largely due to the distance tractors had to operate from their base. The latter being adjacent to the only water supply. This is now a great deal better and the figure should be very small in 1956. Considering the concentration of work the hour per acre figure is poor, and an investigation into the cause of this is proceeding.

484. Busongora is nearly 300 miles away from Kampala and supplies have been very difficult and expensive. With the completion of the western extension to Kasese this should be greatly simplified, and costs should come down.

BUNYORO

485. Total revenue earned was Shs. 28,862. The demand in Bunyoro is for first and second ploughing only. Ten acres only were harrowed.

		acres
Total 1st ploughed	=	207
Total 2nd ploughed	=	282
TOTAL		591

486. It will be seen that the acreage here is less than the Toro figure, but has produced nearly a third more revenue. This is due to the sliding scale charges. Average acreages in Bunyoro are under five, whereas in Busongora they were normally at the cheapest rate, i.e. 20 acres.

487. Most of the work is done for societies, and attention has already been drawn to the acre per person ratio. One would feel happier about the future if there was a significant trend towards more production. This aspect must be carefully watched, and the Agricultural Officer and the Co-operative Development Officer are aware of the implications. It is impossible to satisfy all the demand in the district, and the work has been restricted to comparatively concentrated areas.

BUSOGA

488. Attention has already been drawn to the difficulties of this area. A total of 1,013 hours were done for contract work.

Operation	Hours	Acres	Hours per acre
Ploughing. . .	933	375	2.49
Offset harrow . .	15	11	2.06
Transport. . .	60	—	—
Direct hire . .	5	—	—

489. Tractors were of three different makes, and implements of five different makes were used. The equipment is now standardised, but the future is not sure. Total revenue received was Shs. 11,397.

490. The above should all be treated as in the proving stage, and their function largely investigational. With standardisation, more staff and better training the results will be of real value.

491. In the main, the revenue received has been about half of the costs, and the effort in 1956 is to make all overheads less the European officer covered by the return of the service. This will not be accomplished in one year, but there should be an improvement in Bunyoro and Toro.

LANGO/ACHOLI

492. This is treated separately from the above as the position here is so much better. The total number of tractors in use was 11: all of the same type with standardised implements. Work is concentrated in two main areas, and the service was in great demand, so much so that a rationing system was used. Many factors are in favour of the use of mechanisation here, but it should also be stated that the equipment itself has been most intelligently handled since the start and the objectives kept clear. The position is clearly demonstrated in the following tables. It should be noted that costs include 75% of European supervision and a total of 3,095 hours of transport. Transport is a useful form of revenue as the hire charge exceeds the actual cost by about Shs. 4 per hour. Each tractor also completed more than 1,000 hours in the year and this keeps the depreciation figure per hour down to Shs. 3/30. A large item is fuel and oil at Shs. 5/07 per hour. Petrol is expensive so far from Jinja, and this cost is equal to the total of drivers, mechanics, spares and repairs. It is impossible to avoid this.

Tractor Running Costs, January–December, 1955

			Shs.	cts.
(1) Spares	..	..	17,322	00
(2) Workshop	..	..	3,606	00
(3) P.W.D.	..	..	814	00
(4) Ancillary equipment		..	1,524	00
(5) Workshop wages	..	..	9,515	00
(6) Petrol	..	..	51,911	00

			<i>Shs.</i>	<i>cts.</i>
(7)	Oil grease		4,100	00
(8)	Drivers' wages and bonus	..	23,210	00
(9)	Plot measurers' bonus and wages		10,367	00
(10)	European supervision	..	23,343	00
(11)	Total hours worked	11,039.		
(12)	Cost/hour		13	20
(13)	Rev./hour		11	13

NOTES ON ITEMS:

(1) Actual cost of spares issued to tractors and implements extracted from monthly tractor spares issue sheet.

(2) Cost of smaller spares (e.g. bolts, nails, wood gaskets—welding gas, etc.) difficult to allocate to individual tractors.

(3) Cost of work done by P.W.D. (electric welding, transport of stores, etc.).

(4) Cost of small tools issued to tractors taken on a 3-year depreciation basis.

(5) Wages of Mechanical Assistant, Assistant Mechanic, two spanner boys, Storekeeper and Clerk.

(6) Cost of petrol used—includes petrol used in workshop.

(7) Cost of oil and grease used—includes quantity used in workshop.

(8) Drivers' wages, bonuses and incidental expenses.

(9) Plot Measurers' wages, bonuses and bicycle allowance, includes salary of Supervisors and Assistant Farm Manager learner.

(10) 75 % of Field Officer's salary and mileage allowance.

(11) Gross total of hours worked by all tractors in the unit—includes operational transport.

(12) Revenue earned per hour includes money received for spraying, battery charging and repairs to other department vehicles.

Extracted Figures

Running costs	Total cost	Cost per tractor	Cost per hour
	<i>Shs.</i>	<i>Shs.</i>	<i>Shs.</i>
Fuel and oil ..	56,011	5,092	5·07
Drivers' expenses ..	23,210	2,110	2·10
Mechanics' wages, spares and repairs	31,257	2,841	2·83
	110,478	10,043	10·00

Supervision	Total cost	Cost per tractor	Cost per hour
	<i>Shs.</i>	<i>Shs.</i>	<i>Shs.</i>
Plot Measurers ..	10,367	942	·95
European supervision	23,343	2,122	2·11
DEPRECIATION ..	36,341	3,304	3·30
	180,529	16,411	16·36*

*Does not include depreciation on ancillary equipment—total cost will be Shs. 16·50 per hour.

Cultivation Costs—January–December, 1955

Operation	Hours	Acres	Hrs./ acre	Cost per hour	Cost per acre	Total return	Average return per acre
ACHOLI							
Ploughing ..	4,300	1,496	2·87	Shs. 16·50	Shs. 47·36	Shs. 46,642	Shs. 32·51
Offset-disc. ..	430	318	1·35	16·50	22·28	6,003	18·87
Disc. ridging ..	94	75	1·25	16·50	20·63	1,504	19·94
Planting ..	19	16	1·20	16·50	19·80	224	14·00
Weeder ..	2	16	0·30	16·50	4·95	123	16·00
Transport ..	3,001	—	—	16·50	—	38,503	—
TOTAL ..	7,846	1,921				92,999	
LANGO							
Ploughing ..	2,192	678	3·23	16·50	53·63	23,986	35·37
Offset-disc. ..	49	22	2·30	16·50	37·95	529	24·60
Transport ..	94	—	—	16·50	—	1,351·50	—
TOTAL ..	2,335	700				25,866·50	

Total area of cultivations, Acholi/Lango: 2,621 acres.

Acreage per tractor: 238 acres.

Total hours worked: 11,039 hrs.

Average hours worked: per tractor: 1,003 hrs. } Includes operational transport.

493. The prospects in this area are encouraging and the gap in the costs should be closed in the next two years, always provided the demand can be maintained to achieve the 1,000 hour per year per tractor which is essential.

DEVELOPMENT FARM (*See Appendix 'A'*)

494. In 1955 the Bunyoro Agricultural Company Ltd, Kigumba, near Masindi, had its first full year on a tenant basis; from six in 1954 it has grown to 66 tenants in 1955.

Cereals

495. Over 70 acres of maize were planted during the first half of the year. Although this grew well in its initial stages, the crop was lost because of severe dry weather during May and June. Millet and sorghum also suffered due to this severe dry spell. Harvesting was carried out by mechanical methods which proved a success. This is the only place in Uganda where such methods have been used.

Tobacco

496. Flue-cured tobacco continues to be a disappointment, and even on 3rd and 4th year land the cured leaf was still too heavy. The ratio of green to cured leaf was about 3:1 as against the accepted 7:1, which indicates that the Kigumba soils are too rich for tobacco.

Groundnuts

497. These grew well but the wet weather at harvesting gave marketable yields lower than the 600 lb. per acre necessary to make this crop economic.

Cotton

498. The cotton acreages were most encouraging. The seed was NC.54 from Namulonge, and the crop, sprayed against *Lygus* four times at ten-day intervals, was good. Wet weather during the first pick made the yield uncertain but the fact that such fine cotton has been grown at Bunyoro confirms the view that *Lygus* damage is a very important factor in depressed yields. The 1954 cotton harvested in 1955 showed a variation from 250 lb. per acre unsprayed to over 700 lb. per acre sprayed. 1955 cotton to be harvested in 1956 should show a great improvement.

Livestock

499. Cattle have continued to thrive and if this project is to continue there is a need for a rapid build-up. The main problem confronting mechanisation is the number of operations that are necessary to remove the intense grass and weed growth on fallow land; cattle would assist in keeping down the grass and would make ploughing a much cheaper operation. The cattle continue to be treated with anticide prosalt bi-monthly and no animal has yet been lost due to Trypanosomiasis. East Coast Fever has now been confirmed, and twin calves were lost. This has been a relief, in a peculiar way, as the low incidence of ticks had made the management fear that the risk of infection of E.C.F. was too low, and that a major calamity would, one day, destroy the whole calf crop. It is now hoped that calves will be strong enough to obtain immunity.

SPECIAL PROJECTS

500. In association with the Entomological Section spraying of cotton against *Lygus* was undertaken on a hire basis in Bunyoro and Acholi/Lango. In Bunyoro 17 acres were treated and in Acholi/Lango 25 acres. In both cases hand-operated knapsack sprays were used.

501. The chemical was supplied free and the hand sprayer cost Shs. 25 per acre. Lack of water supplies and badly grown cotton were the main reasons why the work was on a small scale.

502. Results from Bunyoro are not available, but of the three acres sprayed in Acholi a yield of 1,500 lb. of seed cotton has been picked already from $1\frac{1}{2}$ acres, with more to come. The general reaction is favourable and 1956 should see a great increase in the scheme.

MACHINERY RESEARCH AND TESTING

503. This part of the work is now being investigated and a programme of work is to be devised in association with N.I.A.E. in England, Empire Cotton Research Station at Namulonge and members of the Faculty of Agriculture at Makerere College, Kampala.

504. N.I.A.E. intend that they should be directly represented for machinery research in East Africa. The organisation is not yet known. In the meantime the Agricultural Engineer is proceeding with tests on the following lines:—

Basic data on fuel consumption.—Apparatus for this is almost complete, and tests and information should be available in the latter half of 1956.

505. It is hoped to have "Strain Gauge" equipment available, particularly with reference to the three-point linkage systems. With this it will be possible to test the ploughing resistance of various soils in which machinery has to work.

506. In addition, there are many simple types of equipment on which research is needed as they show possibilities of being suitable for Uganda agriculture. There is urgent need for small harvesters for finger millet on the farm level, for cheap safe transport, for small threshing machines suitable for farms of ten acres only, for small versatile machines which are simple in design. So far, they tend to be complicated. African farmers will have to divert their sons with good education back to direct farming if the above are to be successful.

507. As a section in Uganda there is some danger of being out of touch with modern developments. In Kenya the Highland farming system ensures that capital investment in machinery is maintained, and Tanganyika had a considerable investment during the groundnut scheme.

ACKNOWLEDGMENTS

508. One of Mr. Kerkham's best legacies was a staff with high morale. It is pleasant to record the enormous help and enthusiasm given by all. The Research Division is always most helpful, and Field Officers in districts always stress the assistance they are given by other members of the Department.

BUNYORO AGRICULTURAL COMPANY, LIMITED—CROP ACREAGES AND YIELDS, 1955

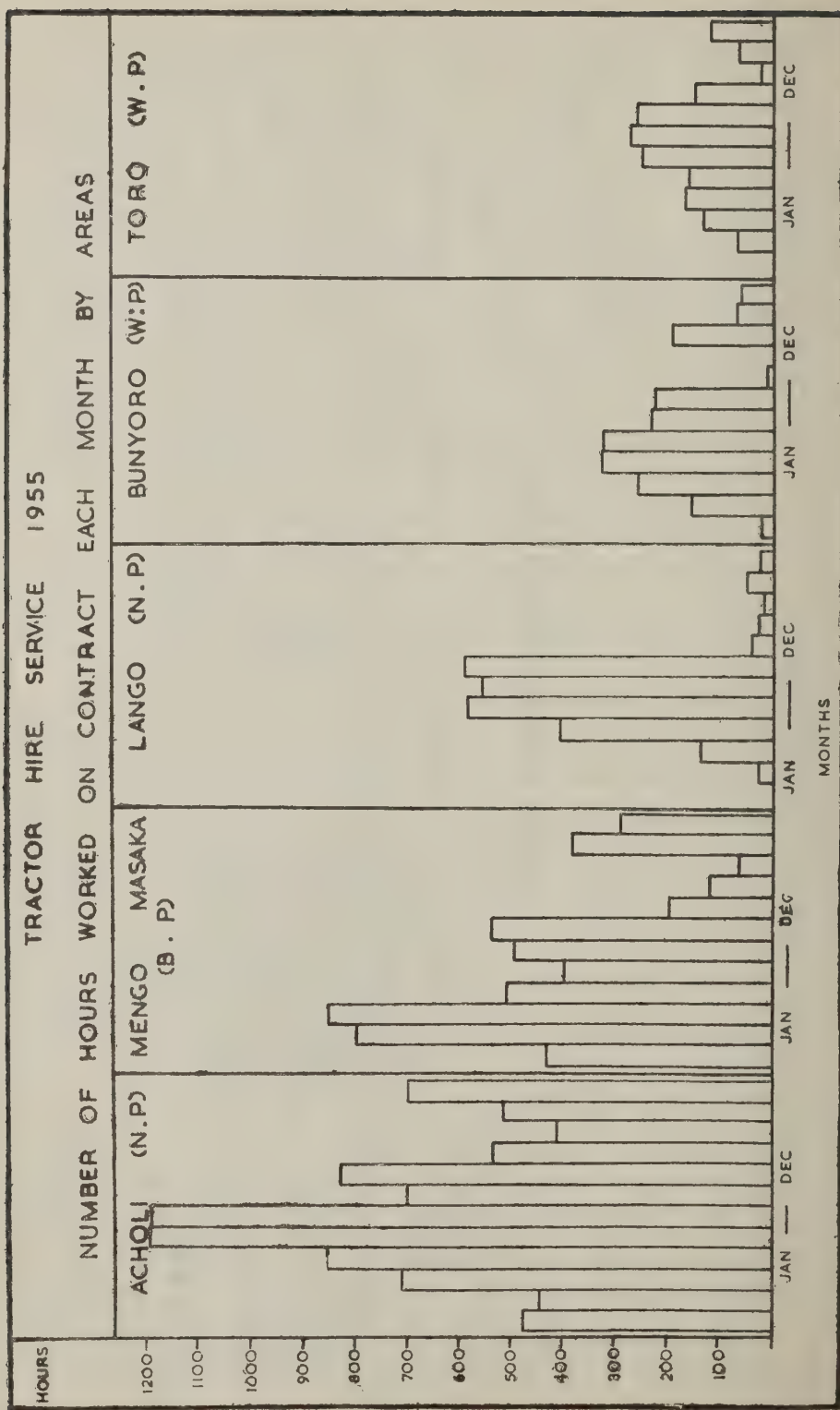
1st Half-Year	KIDIDIMA						RWABIGALAGALA					
	Farm	Gr. 6	Gr. 7	Gr. 8	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	Gr. 9	Gr. 10	Total
BULO Acres	20	6	34	20	8	—	—	—	—	—	—	14
Average yield per acre ..	No crop	633	No crop	No crop	1,207	—	—	—	—	—	—	961
SORGHUM (Dobbs) Acres	34	—	—	—	—	—	—	—	20	—	—	54
Average yield per acre ..	1,786	—	—	—	—	—	—	—	890	—	—	1,454
SORGHUM (L28) Acres	10	—	—	—	—	—	8	—	—	—	—	18
Average yield per acre ..	678	—	—	—	—	—	1,250	—	—	—	—	932
TOBACCO (Green leaf) Acres	36*	10	12	10	10	6	8	10	8	4	2	—
Average yield per acre ..	No fig.	2,819	2,673	3,047	3,226	3,478	3,247	2,451	2,943	2,544	2,358	—
MAIZE Acres	28	40	40	40	—	—	—	—	—	—	—	148
Average yield per acre ..	No crop	No crop	No crop	No crop	—	—	—	—	—	—	—	—
BEANS Acres	—	—	—	—	—	6	—	2	—	4	2	14
Average yield per acre ..	—	—	—	—	—	192	—	485	—	207	258	247
2nd Half-Year												
COTTON Acres	100	20	20	20	20	10	20	18	17	5‡	4	254‡
†Average yield per acre ..	—	—	—	—	—	—	—	—	—	—	—	—
BULO Acres	20	—	—	—	10	20	10	10	—	—	2	72
Average yield per acre ..	890	—	—	—	1,275	830	810	520	—	—	500	853
GROUNDNUTS Acres	—	20	20	20	—	—	—	—	10	—	—	70
Average yield per acre ..	—	314	120	145	—	—	—	—	547	—	—	243
MAIZE Acres	50	—	18	36	17	10	20	20	12	4	4	191
†Average yield per acre ..	—	—	—	—	—	—	—	—	—	—	—	—
BEANS Acres	—	—	—	—	—	—	—	4	14	—	—	18
Average yield per acre ..	—	—	—	—	—	—	—	No crop	191	—	—	191

*Approximately 18 acres only harvested. 236 lb. cured leaf per acre.

‡Not yet available.

UGANDA CONTRACT SERVICE, 1955

DISTRICT	PLOUGHING			DISC HARROW AND TILL			PLANTING			WEEDING AND RIDGING			TRANS- PORT
	Hours	Acres	Hours/ Acre	Hours	Acres	Hours/ Acre	Hours	Acres	Hours/ Acre	Hours	Acres	Hours/ Acre	Hours
Buganda ..	3,327	1,371	2.42	203	140	1.45	238	205	1.16	26	12	2.17	251
Bunyoro ..	1,678	591	2.84	18	10	1.80	—	—	—	—	—	—	62
Toro ..	1,376	657	2.09	—	—	—	—	—	—	—	—	—	101
Lango ..	2,192	678	3.23	49	21	2.33	—	—	—	—	—	—	94
Acholi ..	4,300	1,496	2.87	430	318	1.35	19	16	1.19	96	91	1.05	3,001
Busoga ..	933	375	2.49	15	11	1.36	—	—	—	—	—	—	170
TOTALS ..	13,806	5,168	2.67	715	500	1.43	257	221	1.16	122	103	1.18	3,679



VII. Annual Report—Serere Experiment Station

By D. J. PARSONS, M.C., *Officer-in-Charge*

INTRODUCTION

509. This is the last year that this report will appear under the above heading. It is thought more appropriate to refer to the station as a Research Station in the future. The circumstances which give rise to this change mark an important stage in the development of Serere and give adequate proof of the fruition of many of the plans put forward last year by the Agricultural Productivity Committee. During 1955 money was provided and final plans approved for the new laboratory buildings which provide first-class accommodation for the four sections of the research division. In addition to the botanical and entomological sections, Serere will in future support a reorganised agronomy section and for the first time for many years will have the services of a full-time Soil Chemist posted to Serere with supporting staff. This establishment of four fully staffed and equipped research sections will increase the scope and change the nature of our work considerably. For the first time full laboratory services will become available for dealing primarily with the agricultural problems of the Eastern and Northern Provinces when these plans are fully implemented.

WEATHER

510. The year has seen slightly less than average rainfall, but distribution, particularly in the latter half, has been good. In general, spring crops were only average due to the late arrival of the first rains, whereas second rains crops yielded extremely well. The monthly rainfall for 1955 is given in Table I, together with the 35 years' average for comparison.

TABLE I

MONTHLY RAINFALL FIGURES FOR 1955 WITH THE AVERAGE MONTHLY RAINFALL FOR 35 YEARS 1921-55 FOR COMPARISON

	1955	Average 35 years 1921-55
January	3.18	0.83
February	1.08	2.10
March	2.72	3.50
April	7.35	8.11
May	10.18	7.59
June	3.31	4.26
July	3.50	4.69
August	5.33	6.44
September	4.47	5.72
October	3.70	4.33
November	2.57	3.54
December	4.13	2.16
TOTAL	51.52	53.31*

*This total disagrees with the sum of monthly averages due to rounding off.

511. Unseasonal heavy rain in December interfered with cotton picking but produced a welcome flush of grass with which to enter the dry months ahead. Cloudy wet weather at harvest interfered with the drying of both spring and autumn crops.

FARM CROPS

Cotton

512. The 1954/55 crop harvest was completed on February 10th. Yields over the whole farm averaged 568 lb. per acre of seed cotton. Yields over past years have averaged between 500 and 748 lb. per acre of seed cotton, but this year again the highest yield recorded off any one plot exceeded 1,000 lb./acre, 1,038 lb./acre being recorded off one sprayed plot. Individual fields yielded between 806 lb. and 367 lb./acre seed cotton. This crop was protected against *Lygus* by spraying with D.D.T. as part of the entomological section's trials. The low yields can be attributed in part to severe hail damage during the growing season and in part to unfavourably dry conditions during the latter months of 1954.

513. The current year's plantings got away to a very bad start during June. During 43 days in June and July only one day's effective rainfall (over 0.2 inches) was recorded. Land preparation was difficult and planting conditions were poor, resulting in very uneven germination. Many fields had to be replanted by hand. At the end of July crop prospects were very poor. From that time onwards, however, good distribution of rainfall changed the picture considerably and mid-season growth was excellent. As the year closes picking is in full swing and yields of 750 lb. are already common with picking incomplete. This year spraying of the main farm cotton did not form part of the Entomologist's programme, but spraying was nevertheless carried out in order to obtain maximum seed increase. Fifty acres were sprayed with a Ransomes "Crop Guard" sprayer behind a Ferguson tractor using 1 lb. of technical D.D.T. per acre in 12 gallons of water per application. The insecticide alone cost Shs. 800 for this 50 acres. However, *Lygus* damage was very severe on unsprayed cotton and this spraying resulted in economically sound returns.

514. The following rough figures give an indication of the benefits to the farmer by way of increased profits and to the country by way of increased production, to be obtained from spraying cotton in a bad *Lygus* year such as 1955.

TABLE II

ESTIMATES OF THE COSTS OF PRODUCTION AND RETURNS FROM SERERE COTTON 1955-56.

	Cost of production per acre	Yield/Acre lb. Seed/ Cotton	Returns/ Acre @ 50 cents/lb.	Profit/ Acre
Unsprayed	Shs. 140	400	Shs. 200	Shs. 60
Sprayed	170	800	400	230

515. Spraying has doubled the yield and increased the profit nearly four times. All seed was dressed against blackarm.

516. All land preparation and planting is now done mechanically by ox or tractor, while inter-row weeding of most crops, including all the farm cotton, is regularly completed with ox-drawn weeders and cultivators.

Finger Millet

517. One field was planted early during January and germinated during the fairly heavy grass rains of late January and early February. This field managed to survive the dry spell during the rest of February and most of March and came to harvest in July, thus helping in spreading the harvesting operations. The main crop was not planted until the arrival of the rains in April and drilling was spread from April 5th to April 22nd. This came to harvest between the 3rd and 15th August, having been left on until it was quite ripe, and in a good bird year was combined with little loss. However, the late arrival of the rains and the light falls of June and July did not give good yields. The best field gave 1,252 lb. grain/acre, but the average yield over all fields amounted to 843 lb. grain only. This compares with the record yield last year of 1,663 lb./acre grain and the ten-year average of 1,046 lb.

518. The early crop when planted in January, if it survives the drought following the grass rains during which it germinates, will normally outyield later plantings, but weeding costs will be higher. This year the yield of the early planted field was poor and resulted in sub-economic returns. The later plantings however, even at this low yield level, showed a small profit.

Sorghum

519. In contrast to the poor finger millet yields, sorghum, being a more drought resistant crop, was not affected so adversely by the dry conditions which prevailed during June and July and the first rains grain crop yielded well. Three varieties were grown and the differing yields were interesting. In small plot trials the shorter close-headed "L" varieties have consistently outyielded the taller lax-headed "T" varieties. Our experience over some years of growing L28 and T15 on the farm, however, have given yields constantly in favour of T15. The reason for this was known to be due in part to the greater losses suffered from bird damage by L28. This year yields were as follows:—

			<i>lb./acre dried heads</i>
T15	..	..	1,284
L28	..	..	1,558
L31	..	..	2,545

520. All fields were side by side and bird damage was most serious, as usual, on the L28. The L31 and T15 were barely touched. The L varieties then came to harvest together, leaving the taller T15 to remain for a further seven days. During this week the birds all congregated on the one remaining field with great loss to the crop. Farmers can work out their own salvation from these figures, but it is interesting to note

the extent of crop losses brought about by birds. The species most concerned were the Cardinal Dioch (*Quelea cardinalis*), the Vinaceous Dove (*Streptopelia vinacea*) and the Laughing Dove (*Stigmatopelia senegalensis*). Bishops (*Euplectes spp.*) and the Whydah (*Coliuspasser macrourus*) also took their share.

521. The silage crop sown in April was cut at first flowering and ensiled in pits as usual. Yields were normal. This crop was sown after the nearby grain crop and suffered little from stem borers in its early stages. The grain crop, on the other hand, was severely affected. In future it would appear correct to plant the silage crop first, which will act as a bait for the borers, and follow with the grain crop which may thereby escape severe infestation. The increased tillering in the silage crop due to the stem borer and shoot fly attack may also well be advantageous in increasing the leaf: stem ratio.

522. The second rains crop of sorghum (L31) was used for simple dusting trials by the Entomologist. Treatments were weekly, fortnightly, three-weekly and monthly dustings with one per cent D.D.T. applied with pepper-pot shakers made locally. All treatments produced some measure of control over stem borers and shoot flies as measured against untreated plots. The weekly dustings proved most successful and, although this did not control the pests completely, large yield increases were obtained. The results of this simple experiment are sufficiently encouraging to warrant a properly planned experiment in next year's crop. Yields were generally very good, the 15 acres of late rains sorghum averaging 1,000 lb./acre. Damage by birds was negligible. The practice of treating sorghum as a row crop and drilling at 28 inches was continued. Weeding is then done by ox-drawn implements and costs are considerably reduced, with satisfactory yield results both in the spring and autumn crops.

Groundnuts

523. This was the second year that the Massey Harris groundnut planter was used at Serere and results, while still not perfect, were an improvement on last year. With new plates the 1956 crop should be planted satisfactorily. Weather conditions were not ideal for growth of this crop and due to gaps in the 24-inch rows, rosette disease was severe during June. The crop finally yielded an average of 605 lb. unshelled nuts from all fields which, though poor, compared well with the 441 lb. reported last year. This crop consumes a vast amount of labour at harvest, however, and yields of this nature show only a small profit margin even with the present day high prices. When groundnuts can be dug by ox-drawn machinery a great saving in costs will have been achieved and work to this end proceeds. This is potentially a very remunerative crop but should only be grown where soils are suitable for easy harvesting.

Pulses

524. Ten acres of cow peas were planted in August after finger millet on the Old Farm with the Albion drill at 24-inch spacing. Germination was not good but subsequent growth was excellent and the final

yield of 545 lb./acre of threshed peas was one of the best in recent years. Tepary beans are usually grown interplanted with other crops but this year a five-acre field was planted in a pure stand during August. After broadcasting on the plough furrows following finger millet the seed was harrowed in with ox-drawn harrows. Germination and growth were excellent. Throughout the 71 days from planting to harvest only one weeding proved necessary. With very low costs of production therefore the final record yield of 1,186 lb./acre threshed beans yielded a handsome profit. The very short time to maturity of this crop also makes it suitable as a catch crop and a very late planted field following the failure of one strip of sunflowers yielded satisfactorily at 511 lb./acre. 13 acres interplanted with cassava yielded on average 405 lb./acre with no weeding.

525. Green grams were also planted in a pure stand of five acres as a last chance for this crop. Grams have been grown now for three years in an attempt to obtain another economic second rains crop in this area. Previously yields had been very poor and this year, under excellent growing conditions, the final decision to abandon the crop must be taken following a yield of only 109 lb./acre threshed grams.

Sunflower

526. While the present unfavourable market conditions do not make this very attractive as a cash crop, it is used at Serere as a high protein stock feed. Experience is now being gained as to how to grow the crop and its potential yield level under varying conditions is being ascertained. Six acres were grown in the spring giving yields varying from 700 to 1,350 lb./acre seed. A second rains crop of 20 acres following finger millet ran into difficulties. Sunflower is very sensitive to depth of planting and therefore requires a fairly fine seed bed. This is difficult to obtain following the ploughing in of the millet stubble. The first plantings during early September germinated very poorly and a second discing was necessary before re-drilling was successful, giving a very late planted crop in mid-September. However, after a slow start the crop came away well and with a sub-optimum population of plants per acre did well to yield 540 lb./acre seed during December. Two acres on the experiment farm planted during August yielded at 700 lb./acre. This is a cheap crop to grow and small profits can be made even at a low yield level.

Sweet Potatoes

527. Harvesting of the large acreage planted during 1954 was completed during January and February of this year. As forecast last year the yields of four and half to five tons per acre obtained from the May plantings dropped steeply until only just over one ton acre was obtained from late July plantings. The whole 28 acres of the 1954 crop finally averaged just over two tons per acre. To be on the safe side as many potatoes as possible should be planted before mid-June to obtain economic yields under Teso conditions.

528. Just over 20 acres were planted in 1955 and at the time of writing on no field has harvesting yet been completed.

529. Trials on the mechanical harvesting of this crop by ox-drawn implements are in hand and when a suitable method is obtained costs of production should be considerably lower. A search for a machine to slice the tubers after lifting for drying and making "kasode" is also being undertaken. If these two operations can be mechanised great savings in labour will be obtained.

Cassava

530. The crop planted in June 1954 was harvested during July 1955 and yields of three tons/acre off six acres were obtained. Suitable areas off the main farms and outside the normal rotation are being utilised for the 1955 crop. Following the late arrival of the first rains in mid-April, most of the crop was late planted this year, and entered the new year's dry weather in a very immature state.

Fruits

531. The two main citrus orchards were not maintained up to standard throughout the year due to lack of sufficient funds making regular weeding impracticable. However, a fairly large crop of citrus of all kinds was obtained, the season starting earlier this year than is usual. Seedling issues took place as usual during the first rains. A member of the botanical staff was sent to Kenya during the year to be trained in horticulture and on his return in 1956 bud grafting of citrus for issue in place of seedlings will commence.

532. The banana garden planted in August 1954 suffered no casualties during the 1954-55 dry season and has since flourished. The first harvest was taken less than 12 months from planting and at the end of the year 14,192 lb. of green bananas had been sold off the three acres. The *Dolichos* sp. cover crop used on one strip has not proved a successful substitute for mulch and other cover crops will be tried. Meanwhile, farmyard manure has been applied to this strip and subsequent growth has been good. The garden is now beginning to provide its own mulching material and weevil is very difficult to detect as yet. Shade and mulch both appear to be necessary for the successful growth of bananas at Serere, but by far the more important treatment to ensure good growth is mulching. This is expensive to apply in the early stages but by about 18 months a properly tended banana garden should be supplying most of its own mulching material.

Pests

533. This account of the main farm crops would not be complete without the mention of the numerous animal and bird pests which hinder or cause losses to production in tropical farming. By far the most serious pests are the birds already referred to on the grain crops. 1955 has seen very serious damage and loss to crops caused by the Red Teso Ground Monkey. This pest appeared throughout the year in very large numbers, the troupe being estimated to exceed 70 in strength. Groundnuts are, of course, a favourite food and measures to protect this crop are routine. However, we were surprised when major damage was done to young cotton during

August and September, the immature bolls being stripped off the plant and broken open, presumably with the object of eating the young seed. The pulse crops and sunflower were the next to suffer, particularly the latter crop. Attempts to shoot these animals met with only limited success, while poisoning was completely unsuccessful. An organised hunt also failed due to lack of local support. Root crops also suffered due to theft by monkey, but the main pests of potatoes and cassava are the nocturnal bush pigs which are also hard to bring to account. To these major pests lesser losses due to various other animals and birds must be added. Oribi, duiker, ground squirrels, rats and mole-rats, guinea fowl, francolin and pigeons all subtract their quota from our final yields. The role of a farmer in Uganda is indeed one of a generous, albeit unwilling, supplier of food-stuffs for wild life.

AGRONOMY

Long Term Fertility Experiments

534. Due to the late season the crops on the two major experiments yielded poorly during 1955. The permanent manurial experiment which commenced in 1933 continued in its 23rd year of continuous cropping. The control plots which have received no manures at all during this period yielded almost nothing in the spring under sorghum. Late cotton yields were poor all over. However, this experiment continues to serve as an admirable demonstration of the beneficial effects of manuring with farm-yard manure. This experiment is now almost erosion proof and, were this not so, it is considered that the control plots would have produced nothing at all for many years past, as indeed would be the case under field conditions.

535. The soil fertility experiment which commenced in 1936 has now completed 20 years and its fourth circuit on cycle I. The fifth circuit which commences in 1956 will probably see major changes in the treatments. These will be designed to obtain information on the effect of artificial fertilizers in place of some of the green manure treatments which have now outlived their usefulness. The results of these long-term experiments on fertility, which were reported briefly last year, have been applied to problems in Teso district as reported later when the problem of the co-ordination of crops and stock is discussed.

536. In addition, a new grazing experiment, the layout of which was started during the year, has been designed to test the efficiency of night paddocking animals on resting land as a means of increasing fertility. The fertility of paddocks grazed by night only will be compared with other paddocks in which no grazing and daytime grazing only are allowed. Measurements will be obtained by means of comparing subsequent crop yields.

Pasture Agronomy (by C. R. HORRELL)

537. Some progress has been made in laying out a Grass Experiment Farm. The nursery has been expanded to accommodate the newly introduced species of 1955. About 50 new species and strains of species

were added to the 1954 collection and monthly observations have been carried out on these. Several promising pasture-type legumes and a few grasses have been moved to multiplication plots in order to produce sufficient material for putting into grazing plots in 1957. The most noteworthy of these are:—

<i>Desmodium uncinatum</i>	<i>Cenchrus ciliaris</i>	Several strains
<i>Desmodium intortum</i>	<i>Chloris gayana</i>	SR5316
<i>Glycine javanica</i>	<i>Setaria sphacelata</i>	Several strains
<i>Indigofera subulata</i>	<i>Setaria splendida</i>	SR5444
<i>Pueraria thunbergiana</i>	<i>Cynodon plectostachyum</i>	
<i>Stylosanthes gracilis</i>		

538. Small plots of *Pueraria thunbergiana* and *Stylosanthes gracilis* were sown in mixture in a paddock, with *Chloris gayana* and with *Hyparrhenia rufa* early this year. These two legumes look extremely promising after one season of grazing. *Indigofera endecaphylla*, sown under the same conditions, established well but remains small and does not directly contribute much stock feed.

539. Of several grass mixtures tried in pasture, *Chloris gayana* with *Cenchrus ciliaris* is promising. *Chloris gayana* with *Hyparrhenia rufa*, after two seasons, looks outstandingly more productive than *Chloris gayana* alone, while forming a better sward than *Hyparrhenia rufa* alone. Further sowings of *Melinis minutiflora* this year, failed to establish as also happened last year. This is believed to be due mainly to faulty harvesting of the seed. The legume species in these trials were sown at the rate of three lb. per acre. This appears to be a little on the heavy side, and it would probably be advantageous to reduce the rate per acre to two lb. Heavy seed rates are still used for the grasses since seed quality is poor, germination low and field establishment uncertain.

540. Investigations into the seed production and germinability of several grass species is proceeding. Several interesting problems have been discovered, most of which still await solution. To define the problem, however, often goes half way to solving it.

541. The table below gives random "pure seed" counts for six major grass species harvested by hand. (The term "pure seed" being defined as a "seed" containing a caryopsis).

TABLE III
"PURE SEED" COUNTS: SIX GRASS SPECIES

	Highest	Lowest	Average	No. of samples
<i>Cenchrus ciliaris</i>	59	40	49	10
<i>Chloris gayana</i>	51	14	28	8
<i>Hyparrhenia rufa</i>	18	2	8	6
<i>Panicum maximum</i>	50	0	19	8
<i>Melinis minutiflora</i>	52	15	34	8
<i>Setaria sphacelata</i>	55	0	19	4

542. Germination tests have been carried out on "pure seed" only and the following table gives the order of the figures obtained:

TABLE IV
PERCENTAGE GERMINATION OF "PURE SEED": FIVE GRASS SPECIES

<i>Cenchrus ciliaris</i>	..	..	..	14
<i>Chloris gayana</i>	..	..	..	20
<i>Hyparrhenia rufa</i>	..	..	..	32
<i>Panicum maximum</i>	..	..	..	41
<i>Melinis minutiflora</i>	..	..	..	9

543. When the "pure germinable seed" percentage is calculated from these two tables it will be found to be very low in all cases. The possible reasons for this fall into several categories, such as inadequate plant nutrition, attack by insects, attack by plant parasites and physiological defects. A study has begun on the effect of nutrients. The inflorescences of *Chloris gayana* have been found to be very severely infested, and those of *Hyparrhenia rufa* slightly infested by *Chirothrips* sp. The inflorescences of *Panicum maximum* and *Setaria sphacelata* were so heavily infested with smut (*Ustilago spp.*) on many of the plots this year as to render seed harvest impossible. *Cenchrus ciliaris* heads showed heavy infestation by a loose smut (species unidentified) in the late part of the year only.

544. In other countries, the need for a period of dormancy or "after ripening" has been found necessary for several of the species listed above and there are indications to the same effect here where *Chloris gayana* and, in particular, *Cenchrus ciliaris* are concerned. Other species require further testing on this point.

545. Insects proved to be a major problem where the seed production of some species of legumes was concerned. Species of Meloid beetles (*Coryna apicarnis* Guer. and *Zonabris* spp.) voraciously consumed the floral parts of several legume species, until they were controlled by dusting with D.D.T.

546. The number of seeds per pound has been calculated from sample counts for a number of species. Working approximations for some of the grass species which are most likely to be of immediate interest are here quoted:—

No. of seeds per pound			
<i>Cenchrus ciliaris</i>	..	..	200,000
<i>Chloris gayana</i>	..	..	1,400,000—1,500,000
<i>Hyparrhenia rufa</i>	..	..	1,250,000
<i>Panicum maximum</i>	..	..	600,000— 625,000
<i>Melinis minutiflora</i>	..	..	6,000,000
<i>Setaria sphacelata</i>	..	..	1,400,000

547. Even taking into account the low figures obtained for "pure germinable seed", it would be expected that, with large numbers of seed per pound, our present sowing rates of 20–30 pounds per acre were still unnecessarily high. Since this is not so, however, we must assume that our knowledge concerning grass establishment is at fault. It is expected that seed dressing, both against insect, fungal and bacterial attack in the soil after sowing will be beneficial.

548. Every year seed of *Chloris gayana* is bought from the surrounding populace for use on the farm and for use on other Government stations in the districts. A record quantity of 5,500 lb. was bought this year.

549. The difficulty of getting the ley established as part of the farming system of a peasant community is likely to be every bit as great as the technical problems involved in first producing the ley. First, the cost of establishing the ley and, secondly, the return from its utilisation will need investigation. The question of whether an adequate return per acre will be possible from leys grazed by low yielding indigenous stock is undoubtedly an important one.

550. The question of cheap and certain establishment enters the present programme of pasture research. Direct sowing of grass in the spring of the year is a costly process, often involving the use of a plough plus all the other operations necessary to produce a good seed bed. Under-sowing of an early rains cereal crop in the last year of the crop rotation is possible. Under-sowing of a late rains crop in the last year does not give certainty of establishment under our rainfall conditions. Where cassava is the last crop of the rotation and is required to remain in the ground until the early part of the fourth year, under-sowing with *Chloris gayana* will give a rough and ready ley provided the under-sowing is not left until too late in the year. Successful establishment was achieved here when cassava, which was planted in early May, was undersown in late July. It remains to measure any possible depression on cassava yield, due to under-sowing, when the crop is removed next spring. Observation has shown that the most successful method tried this year was to direct re-seed at the end of July after taking off an early rains crop. By this means, a good sward was rapidly produced which provided considerable grazing late in the year. In preparation for this particular ley, the land was merely disc-ploughed and the grass seed sown on the surface and allowed to be washed in by showers, which are frequent at that time of the year. If the previous crop has been kept clean a good clean seed bed is produced by this method and competition from weeds when the grass seed is germinating is minimised.

551. The application of fodder conservation and the growing of special fodder for dry season keep is questionable where the products of the labour are to be fed to stock of low yield potential. Nevertheless, some consideration is being given to the possibilities of these practices. Hay, which is relished by our stock once they have become used to it, can be made relatively easily from *Chloris gayana*. As estimated, 12 tons was made from nine acres of second year ley in mid-June after shutting up the field from early March.

552. Other investigations are concerned with the growing of *Setaria splendida*, *Panicum maximum* and elephant grass in rows, for cutting as silage in the wet season and for grazing in the dry season. The possibility of adding climbing legumes, such as *Pueraria thunbergiana* and *Glycine*

javanica to mixtures for such purposes will be tried as will also the annual inter-cultivation and inter-cropping of row planted elephant grass with velvet beans.

553. The fixation of nitrogen by legumes is also receiving attention. Inoculation of legume seeds with cultures obtained from the Scott Laboratories, Nairobi, is carried out when possible. It has been observed with some perennial, non-inoculated legume introductions, however, that while they frequently do not nodulate in their first year they sometimes do so satisfactorily in their second year. *Pueraria spp.* and *Stylosanthes gracilis* are notable examples which behave in this way.

554. A randomised block experiment containing two grass species and two legume species was planted during the year, designed to measure the effect of the legume on total production. The experiment will last three years. If there are any effects, they are expected to become visible from next season onwards. A further small trial on the same problem is being carried out in pots.

555. Early in the year an experiment was planted, containing six grass species, to compare their yields under two systems of cutting over a three-year period. Yield figures (green weight) for the first season are quoted below.

TABLE V
CUTTING AT TWO-MONTHLY INTERVALS (LB. GREEN WEIGHT)

	27-5-55	28-7-55	2-10-55	15-12-55	Total	Calculated cwts. per acre
<i>Cenchrus ciliaris</i>	81	100	145	67	393	249
<i>Chloris gayana</i>	169	86	115	36	406	257
<i>Hyparrhenia rufa</i>	258	192	276	97	823	522
<i>Panicum maximum</i>	287	175	196	72	730	463
<i>Melinis minutiflora</i>	30	108	276	88	502	318
<i>Setaria sphacelata</i>	6	109	279	76	470	298

TABLE VI
CUTTING AT THE FLOWERING STAGE (LB. GREEN WEIGHT)

Date	27/5	9/7	13/7	15/8	4/10	5/10	11/10	21/12	lb. per plot	Cwts. per acre calculated
No. of days after first cut ..	0	44	48	81	130	131	137	279	—	—
<i>Cenchrus ciliaris</i> ..	53	—	79	—	163	—	—	63	358	227
<i>Chloris gayana</i> ..	113	—	62	—	133	—	—	—	308	195
<i>Hyparrhenia rufa</i>	194	—	—	226	—	115	—	78	613	389
<i>Panicum maximum</i>	256	—	—	300	—	125	—	—	681	432
<i>Melinis minutiflora</i>	64	—	—	—	—	—	442	—	506	321
<i>Setaria sphacelata</i>	10	45	—	159	—	193	—	72	479	304

556. There is considerable variation in dry matter content of these grasses. It is hoped, at a later date when facilities are available, to obtain correction factors to bring these yields to a dry matter basis, which will be more accurate in the evaluation of the species.

Crop Agronomy

557. The clearing of the main farms east and central continues. Two blocks on each farm are now under crops and the third block is cleared and prepared for opening to cotton in 1956. Each block is 30 acres (central and east combined) made up of an even number of parallel strips based on a central true contour. Each strip is divided by a three-yard grass wash stop. The blocks are divided by grass discards in which tree wind breaks are planted and which are used in addition as access roads. The new layout has been undertaken, in order to improve the efficiency of mechanical cultivation, and experience during the last two years has proved that this object has indeed been achieved. As each block of 30 acres goes down to grass after its three years cropping it will be fenced and used for the night paddocking of cattle.

558. The problem of farming for profit continues to be the all important problem exercising the minds and activities of agriculturists in Uganda. In the areas which are served by Serere, the absence of any highly productive perennial crop, such as coffee or bananas, is acutely felt when farming systems designed to give economic returns are being considered. Under normal conditions of peasant farming the crops that exist in these areas cannot support heavy overhead or working costs and ox-drawn implements are definitely preferred to tractor cultivation for this reason. Secondly, although it is true that most spring crops will show a profit given good average yields, the second rains crops, excepting cotton, are in most years definitely uneconomic. The search for further high yielding crops capable of producing economic returns in the late rains, not excluding pasture crops, continues, while experience in the practice and technique of growing existing established crops multiplies. Tobacco is to be grown on a purely observational basis during 1956 and the growing of fodder grasses and legumes as row crops is being investigated. Soya beans, velvet beans and sword beans are under observation. The establishment of a chemistry section at Serere during 1956 will enable further and more detailed work to be undertaken on soil fertility and the use of fertilizers. The responses of different crops to fertilizer applications and the effect of insecticidal control of pests on fertilized crops will be translated to economics in the field and may well alter the whole picture of crop agronomy in these areas. The results of previous fertilizer trials in the Eastern and Northern Provinces give great hopes that their applications will, in fact, prove to be economic.

559. The growing of food crops on a combined cash and subsistence farming system severely limits the potential pecuniary returns to the farmer. It is true to say that in the case of many food crops it is more economic to leave them out of the rotation altogether and grow cotton or some other crop which can be marketed efficiently in their place. The

cash produced thereby will in most cases be sufficient to purchase locally more food than can be grown on the same acreage. Of course, if every peasant was to take this view, food would not be available in sufficient quantities. This would lead to a rise in the price of the food crops concerned and finally specialists will arise in the form of food crop farmers which will mean that all crops will become cash crops as in fact is the case in more advanced countries. It would seem to be safe, therefore, and in the correct line of advance to encourage progressive farmers in the first instance to concentrate on money producing crops for the most part and buy in local food which cannot give an adequate return per acre. In this way, land utilisation should be improved. The money producing crops will, of course, include those food crops, particularly finger millet, which can show a profit so that the farmers basic food requirements will still be home-grown with some over for sale.

560. Although in this part of Uganda rotations are more standardised and efficiently carried out than in some other areas, the need for properly planned farms and rotations designed to improve farming systems and land use is great. In order to be able to plan farms efficiently, a great deal of basic knowledge on the crops and rotations suitable for the various districts is essential. Much of this basic information has been obtained at Serere. There is, however, room for further study of the economics of farming systems in these areas, which study will of course also include the co-ordination of stock with crops and lead to a well-balanced system of mixed farming which, as well as being financially attractive, must also provide for the maintenance of soil fertility.

The Integration of Stock and Crops

561. One of the most important results arising out of the analysis of the Serere soil fertility experiment reported last year was the finding that a rotation including two years of rest under natural regeneration following a three-year cropping period was adequate to maintain soil fertility under our conditions. Departmental policy has in the past encouraged a 3:3 cropping ratio, that is a period of three years rest following three years cropping. The conclusion that a farmer may now safely cultivate three-fifths instead of only half his land each year should not be arrived at lightly. If crops were a farmer's only interest this conclusion could perhaps be translated onto the land without further thought. Even here, however, this is not the whole story. If a farmer was interested in crops alone the permanent manurial experiment indicates that no rest at all may be necessary provided between 20 and 30 tons of F.Y.M. were applied once every three years and provided erosion was completely controlled. The fact that 20 tons F.Y.M. would not be available to a farmer without stock need not necessarily rule this finding out as academic. Similar results may well be obtainable from the application of artificial fertilizers. Whether a man cropping all his land all the time will find the practice of maintaining fertility by purchasing artificials to be economic or not has not yet been answered. However, where a farmer owns stock, it is the essence of good farming that these animals be included in the farming system. In the

areas we are dealing with cattle are, in fact, a very important part of a man's life. This being so, is the reduction of the grass areas from one-half to two-fifths of his land necessarily an advance: Obviously the answer to this question depends upon two factors. Firstly, are livestock able to produce more or less per acre than crops? Secondly, how many head of stock must a man carry, bearing in mind the social reasons for cattle keeping which cannot immediately give way to purely economic reasons? The second of these points is already adequately covered by policy which has aimed for some years to encourage the farmer to take over from communal herdsmen sufficient breeding stock to keep on his farm and care for himself. The first point, however, must be decided upon in the light of a full appraisal of all the conditions pertaining to each individual farm. Proximity to a large milk market with present day prices for milk probably give the highest hopes for an economic return from improved stock on the farm. Under present conditions, as they are in the vast majority of cases, preliminary investigations do not show great prospects for economic beef production. With improved farming practices and higher levels of management of improved stock, however, this outlook may alter for the better. The point at issue is that a wholesale shift from the policy of encouraging a three year's rest to the adoption of a two year's resting period as standard should not be undertaken as a general measure without adequate thought being given to each individual farm on its own merits.

562. The comparison between the efficiency of grass rest as compared with manure alone as a measure of maintaining fertility is also a very interesting one. Under our conditions the two year's natural grass in a five-year rotation is very much more efficient than even 30 tons of F.Y.M. per acre once every three years with continuous cropping. The fact that the large dressing of F.Y.M. required to maintain fertility on a continuous cropping basis (between 20-30 tons) will almost certainly not be available to any farmer is a further reason for encouraging generally the adoption of an adequate grass resting period in favour of concentrating on the application of manure. However, it should immediately be added that manurial effects should not be under-estimated. Results, again from the soil fertility experiment, give adequate grounds for encouraging the use of manure combined with an adequate resting period. The adequate rest is the more important: the optimum is the combination of rest and manure.

563. Having established this, the problem of getting the manure onto the land is one of the first importance. There are three methods of applying manure. Firstly, the manufacture of proper farmyard manure in a covered kraal by adding bedding every day or so to the dung dropped by the cattle each night and its subsequent carting from kraal to field. Secondly, by the conservation of dung alone and its subsequent removal to the field. Thirdly, by night paddocking. To discuss these measures in turn. The first, the manufacture and use of F.Y.M. has been an item of propaganda for many years. Some few farmers have adopted it. These are usually the richer men and farmers with a good supply of labour and

capital on call. The system does not lend itself to peasant farming, however, as lack of response has been made only too obvious in the past. The labour requirements of carting bedding and the ultimate removal of the manure to the field are considerable, while the capital outlay on the building of a covered kraal and the purchase of a cart to make its removal possible are not negligible. The use of dung on the other hand requires no carting of bedding and is therefore cheaper. However, its removal to the field still remains a problem and its efficiency as compared with F.Y.M. is not great. All the elements contained in the urine will be lost and much weathering of the dung itself, causing losses, will take place. Night paddocking, by which is meant the fencing of a farmer's resting land and the keeping of his stock in such paddocks at night, is a possible alternative. Capital costs of fencing are not great. No transport of manure is necessary as it is deposited by the animals on the farm where it can be ploughed in together with the grass when the field is opened for cropping. This system is ideal in conjunction with the use of communal grazing areas off the farm itself during the day, and its beneficial effects result from the fact that cattle do most of their grazing by day and drop most of their dung (70%) by night. This system is also preferable to kraaling from the point of view of the cattle, some grazing being done at night and in the early morning, both of which are denied to cattle kraaled at night and, as is often the case, not let out of the kraal until 10 or 11 a.m. The main practical objection to this third method of getting manure onto the land is the theft which may occur if cattle are left in a paddock some way from the homestead at night. The benefit to crops of night paddocking has been amply demonstrated at Serere and experimental proof is now being obtained. Once again the farmer or his advisor must, in each individual case, decide for himself which of these methods will be suitable, practical and economical. The importance of the use of manure and therefore the integration of stock with the farm is fundamental to an improved system of farming and improved returns, thereby making an improved standard of living possible in Uganda.

LIVESTOCK

Cattle

564. The herd of Zebu cattle numbered 355 head on December 31st, an increase of 56 head over last year's figure. This increase is the result of stopping sales and the rearing of all female stock born in an endeavour to obtain a true value of the worth of our breeding bulls. The policy for the herd remains one of developing cattle that will give sufficient milk both to enable calves to be well nourished during their early life and to enable the owner to obtain sufficient milk for his family. The mortality rate of calves in Teso District is given by the Veterinary Department as 40%. This is primarily due to ill-nourishment during the calf's early life and subsequent death due to secondary infections following E.C.F. A well-nourished calf will throw off the primary infection very much more readily and mortality is considerably reduced. Another important limiting

factor in economic beef production is the long time needed by local stock to reach maturity. Although maturity can be hastened by good management, it would appear from our experience that some beasts are more readily able to take advantage of a very high plane of nutrition than others. It is by using the former for breeding that we hope to produce cattle capable of early maturity under a good standard of management. Table I shows the increase in the rate of growth of the bulls selected for breeding, those born before 1951 being compared with those born since that year. The young bull Parsons II, out of the highest yielding cow, Amiro, created a Serere record in February by gaining 83 lb. in 28 days at the age of three to four months.

565. The daily average milk yield per cow again dropped slightly during 1955 (Table II). This was occasioned mainly by the large influx of first calving heifers, many of which were very disappointing. From the records available it is not possible to attribute this result to any definite genetical reason. From experience in management it can, however, be attributed in part at least to the heifer having access to its calf immediately after birth. It is not practicable at Serere under existing staffing conditions to obtain stockmen of sufficient integrity to make the immediate separation of the calf a certainty whatever hour of the night it is born. It is certain that in many cases the heifer's first lactation has been very adversely affected by the calf suckling during its first night after parturition. Staffing of the livestock section will be greatly improved during 1956. However, consideration will certainly be given to the adopting of the semi-range system of calf rearing in order to obviate this difficulty, which, at the moment, is affecting very adversely the efficiency of our breeding programme.

566. The purchased bull "Odio" having replaced "Okwi" in the semi range herd, a fourth herd of milked out cows running with the latter was started during the year. Three more young bulls, all from 400 gallon cows, are now being reared to replace the existing herd bulls "Watson" and "MacDonald" when they have given a calf crop of sufficient numbers to enable a progeny test to be carried out. These young bulls have all gained weight at a very satisfactory rate during the year. It has been found preferable to leave calves in the calf groups longer than previously. Calves which were put out into paddocks at nine months were found to lose condition badly after weaning. In future they will be left with access to concentrates until 12 months of age before being turned out to a diet of grass alone.

567. The production ration trial mentioned last year is being continued with no very clear cut results. It must be remembered that although we give milking cows supplementary food at Serere according to their production of milk, this is not necessarily a true "production" ration as we have no means of measuring accurately the true "maintenance" requirements of our stock under grazing conditions that vary widely from season to season. It would appear from these trials that at some time of the year supplementary feeding is necessary to obtain optimum milk yields, but

that at other times the keep available on the pastures is sufficient for maintenance and production. When sufficient data has been accumulated it may be possible to predict when natural feed is sufficient and during which season supplementary feeding is therefore uneconomic.

568. This year, as last, the daily average milk yield per head was high during the dry months of the year and fell off with the rains, remaining at a low level to the close of the year. Table III shows the variation in daily milk yield per head in successive months, together with the monthly calving figures. There is now no doubt that our Zebu cattle prefer dry conditions to wet and, providing keep is sufficient, are able very efficiently to convert very poor grade fodder into beef and milk. The feeding of silage in the height of the dry weather continued and the feeding of hay during the rains when pastures were very "lush" was introduced for the first time. This and other efforts will continue to be made to bring the daily average yields up corresponding to the calving figures during the present unsatisfactory wet season period.

Pigs

569. The small herd of Wessex saddlebacks continue to supply breeding stock for various stations. Demand from African farmers is, however, very small and the herd has been further reduced to three breeding sows and a boar only.

Sheep

570. During June, 97 sheep were purchased in Usuku county of Teso District. The main purpose of this flock is to utilize them in grazing small plots of legume and grass species and mixtures, thereby making it possible to test new species under grazing at an earlier stage of seed multiplication. The flock is weighed at fortnightly intervals and after large initial gains the live weight increases fell off rapidly. This is thought to be due to a heavy worm burden brought about by running a large flock. Dipping and drenching are now a regular practice and it is hoped that the animals will gain condition once again as the worm problem is controlled. Vital statistics are being kept which show that so far the heaviest ram weighs no more than 100 lb. and that out of 60 lambs born in six months not one case of twins has been recorded. Observations will continue.

Poultry

571. The flock of Rhode Island Red poultry has been increased in order to provide a breeding flock of about 100 birds in 1956. The management and feeding system described in last year's report has continued. Stock keep very healthy under this system and there has been no evidence of any form of disease in the flock. It would seem that the home produced ration fed to adult stock is not entirely suitable for high egg production though it maintains good health and good body weight.

572. After a break last year, hatching was resumed in January using both hot water and hot air type incubators. The overall hatching percentage for the year was 55% compared with 46% last year. Production was not high, averaging $102\frac{1}{2}$ eggs per bird compared with $111\frac{1}{2}$ last year. Flock size averaged 35 birds. This flock has recently been sold to a nearby Mission where a commercially produced layers mash is being used and the egg production of the birds seems to have increased as a result. Interest in Rhode Island Reds is increasing and several Missions in this area now maintain small pure bred flocks from which they sell surplus cockerels and hatching eggs. A surprisingly large proportion of the poultry at the Teso District Show were R.I.R. coloured-marked. From Teso District alone 35,380 poultry of all kinds and 190,395 eggs were exported in 1954, mostly to the southern townships and Buganda. (Figures from District Veterinary Office).

573. Distribution of stock for this year and last year compare as follows:—

			1954	1955
<i>Breeding stock:—</i>				
Cockerels	..	..	33	128
Pullets	..	..	—	79
Chicks	..	..	89	382
TOTAL BIRDS			122	589
<i>Hatching eggs</i>	..	..	382	380
<i>Table birds</i>	..	..	57	31

574. The figures for egg production refer to the Serere strain which was originally imported from S. Rhodesia in 1952. Three other strains have been introduced this year,—the “Sykes” strain from Entebbe and two strains from Kawanda. The former strain did not promise well. The birds were small in body, produced small eggs and did not lay any better than the Serere birds. This strain has now been eliminated. The latter two strains promise well and both show signs of maturing a little earlier than our Serere birds, at a good weight.

575. One hundred and thirty-six day-old chicks, which included 36 Black Australorps, were received by air from the Livestock Improvement Centre, Entebbe. These were reared and sold for breeding purposes. Ultimately our main function at Serere will be to rear day-old chicks received from Entebbe to three months for distribution locally.

576. Our turkeys are increasing in popularity. Two toms were introduced from Amuria Mission to bring in new blood. Twenty-one birds have been sold to Missions and other organisations for breeding purposes and 136 eggs sold for hatching. Young turkeys have proved relatively easy to rear at Serere. Hens are used where possible but some poults have been hatched and reared artificially. There were several losses of turkey hens during the year from snake bite, the birds being attacked when they escaped to lay in the long grass.

577. Baby chicks were used on several occasions during the year to test for possible toxicity in some of the pasture legume introductions. In each case the legume material was dried and ground and fed as an added 10% to the normal balanced ration. The method is suitable for testing toxicity other than that due to prussic acid.

EDUCATION SECTION (By J. F. LOW)

578. Owing to a number of unavoidable circumstances, the section's activities were considerably reduced during 1955. One of the main reasons was the work entailed on the site for the new main Farm Institute, and, secondly, the absence on vacation leave for three months of the officer in charge of the section.

579. A total of 357 persons attended the reduced number of courses held at Serere during the year. In addition, 11 Makerere students attending their first year's practical agriculture were in residence under the Makerere lecturer in Agriculture.

580. The courses held were as follows:—

1st year learners on Instructors' Course.

2nd „ „ „ „ „

581. This was the first year of the change of title from "Apprentice Course" to that of "Learners Course". Under the new system, as a temporary measure until the Farm Institute opens, the best six of the first year learners were chosen to continue as second year learners in a three years' course.

582. A total of 211 men and 15 women attended the weekly chief and cultivators courses throughout the year from all parts of the Eastern Province. The one month's intensive course for chiefs and their wives took place in September. The course is an annual one under the control of an administrative officer. Twenty-one chiefs and 16 wives attended. The wives attended the agricultural classes and also had a special course arranged. All agricultural subjects were taken by Serere staff, plus some assistance from the District Agricultural Officer, Teso. Many courses, such as the Staff Teachers' two months' course had to be excluded but some others were carried out in their respective districts by the District Agricultural Officer concerned.

583. The usual visits of school children took place amounting to a total of 94 children. A few parties of children failed to turn up on their respective dates due to failure of transport arrangements. Thirteen Young Farmers' Club teachers were fitted in for a short one week's course.

MACHINERY (By D. J. PARSONS and G. J. WEBB)

584. As previously reported, the role of ox-drawn implements is an important one in Uganda. The range of implements under trial was utilized for as many operations as possible during the year and further experience was gained as to the suitability of different types. Some

ploughing and discing, much harrowing and virtually all the farm weeding was carried out by oxen. Various interested individuals and district teams were advised, in the light of our experiences, which implements were suitable for African farm use, and in conjunction with the Teso District Team avenues of supply to farmers were explored. It is hoped during 1956, in collaboration with the Development Section of the Department, to equip a workshop and work on the introduction and modification of harvesting machinery suitable for use on small acreages.

585. Owing to the fact that the Serere main farm area is too large for ox-drawn machinery to fulfil all needs, much work has to be performed by tractors and tractor-drawn implements. At the beginning of the year the tractor strength at Serere was made up as follows:—

- 2 Ferguson petrol engine tractors.
- 1 Fordson Major kerosene engine tractor.
- 1 Caterpillar D4 diesel engine tracklayer.

586. During the year we received the following additional equipments:—

- 1 Fordson Major P6 diesel engine tractor.
- 1 Caterpillar D4 diesel engine tracklayer.
- 1 New Ferguson petrol engine tractor.

587. There were also two Fordsons Major kerosene engine tractors belonging to Special Development Section based at Serere for district work. These machines are reported on separately.

588. Cultivation operations commenced in January when block six, old farm, was disc-tilled and sown with finger millet; the machine used for planting was a bean seeder unit mounted on a Ferguson tool bar. In February Block A East and Central Main Farm was prepared for the finger millet crop. Owing to the very heavy weed and grass growth on these blocks after the previous crop of cotton, the whole area had to be double ploughed in order to obtain suitable seed bed conditions. During February a serious attempt was made at tractor mouldboard ploughing, and the implement used was a Ferguson mounted two furrow plough No. 10 G.P. This operation was confined to the Experiment Farm which is known to be clear of obstacles, where Blocks A, B, D and E, all of ten acres each, were ploughed. A small area was also ploughed for the introduction of a new nursery for citrus, etc. The initial results of these operations were good, trash was fairly well covered, and a uniform depth was maintained; the ground was also left in an even state. As opposed to disc-ploughing, the second operation of bringing the ground down for planting was quite simple, all that was required on most fields being an ox-drawn zig-zag or disc-harrow. More of this type of tillage will have to be done before it is known whether results will differ in any

way from disc-ploughing. The drawback to the everyday use of a mould-board plough at Serere is purely financial, as the plough shares cost Shs. 58 each, and have an average life in the Serere soil of about 15-20 acres. Apart from the replacement of shares, there were no breakages on the plough.

589. Groundnuts were mechanically planted with a two unit Massey Harris planter, converted for mounted operations in conjunction with a Ferguson tractor. Germination was good but, as the minimum width of rows is set at 28 inches, to allow the following up of ox-drawn weeding equipment, seed rate was not high enough for density required. We have now obtained some heavy rate seed cells from Kenya and it is hoped that results required will be forthcoming during 1956.

590. The Albion force feed drill was again responsible for planting the bulk of the food crops, such as sorghum, finger millet, cow peas and sunflower. This machine is now in a "work-worn" condition, but a new drill should replace it during 1956/57. The cotton crop was again planted with the Ferguson mounted two row prototype planter: the machine worked well, with no breakages. The Ferguson two-disc mounted ploughs were used constantly throughout the year doing a useful job of work with a minimum of breakages. They were also used to cut road traces on the Farm Institute site at Arapai. The three-disc mounted Fordson plough was also used to good effect although the strain on the old type Fordson lift is sometimes too much for the hydraulic system.

591. The Massey Harris clipper combine harvester was used throughout the year, as occasion demanded, doing stationary threshing of the various food crops. It became mobile during July and August and harvested the standing crop of finger millet very successfully. The necessary equipment has now arrived and the machine will be converted from power-take-off to engine drive for 1956. This should greatly assist the difficult operation of initially opening strips, and a better threshing percentage should also be obtained.

592. The Serere D.4 was broken down at the beginning of the year as the expense and labour required to put the machine into order were not justified due to its general condition. It was agreed that if the D.4 which was of the same vintage (1935) could be transferred from Busoga Farms, the bulldozing equipment could still be used to good effect. This machine arrived in April, until which time, apart from tree winching, the clearing programme was at a standstill and gave cause for anxiety. As soon as UPA 187 arrived, bulldozing equipment had to be transferred from UPA 124: this was successfully accomplished and clearing commenced again towards the end of April. The machine worked steadily for the rest of the year, by which time the whole of Block B, Main Farm East and Central, had been cleared and Block C completed.

593. UPA 187 recorded 433 hours from the time it started work at Serere until the end of the year. This is the highest figure that we have recorded since bulldozing commenced in July 1953. Hours for 1953 were 257, and for 1954, 334 hours were recorded.

594. The two Ferguson tractors worked throughout the year on a slightly lesser scale than in 1954, recording between them $1,691\frac{1}{2}$ hours. Breakdowns were rare and, apart from routine overhauling, there were no serious defects. The farm Fordson also did a good job of work throughout the year with no major breakdowns. Towards the end of the year a new Ferguson tractor was taken on charge and should prove very useful for the coming season. Total tractor hours for 1955 were $2,825\frac{1}{2}$.

595. Tractors and trailers were used at high level, carting various crops, building materials, etc. Trailers gave very little trouble, and a locally-made trailer was purchased in September, bringing the strength to one four-wheel and three two-wheel trailers. The Serere lorry UPA 122 achieved the impossible by still remaining in a road-worthy condition at the end of the year after having a very busy time.

596. A new lorry is on order and should arrive early in the new year. The Standard Vanguard pick-up continued to run satisfactorily.

597. The workshop and driving personnel changed little during the year. The European mechanic proceeded on long leave in May and rejoined the section in late October. During this period the workshop and equipment were in charge of the senior African mechanic. That everything ran smoothly, and the station programme was able to keep up to schedule, was a noteworthy reflection on his efforts. This would not have been possible if the rest of the staff had not co-operated to the best of their ability.

598. Many and varied were the repairs undertaken and completed during 1955. Lessons and instructions on the more technical equipment of tractors and implements continued and the African mechanics were able to carry out with confidence certain types of repairs that may have defeated them in 1954.

599. The new rest house was completed during the year and is now available for passing visitors. One hundred and thirteen visitors signed the visitors book in 1955 and many more individuals and parties paid visits for instructional and other purposes. It was decided that the P.W.D. will assume responsibility for all buildings on the station. For this reason and also to carry out and supervise a new building programme costing over £40,000 during the financial year 1955/56, a permanent P.W.D. Sub-Overseer was posted to Serere during August, 1954.

TABLE I
WEIGHT MATURITY OF HERD BULLS

Age of bulls in months	Average weight of 5 herd bulls born after 1951	Average weight of 3 herd bulls born before 1951
	<i>lb.</i>	<i>lb.</i>
Birth ..	38.4	36.0
6 months ..	285.5	123.3
12 months ..	400.4	213.3
18 months ..	483.2	318.6
24 months ..	579.0	432.6
30 months ..	714.0	535.6
36 months ..	835.0	620.6
42 months ..	908.0	735.6
48 months ..	977.0	812.6

TABLE II
YIELD OF COWS (MILK PER DAY)

Year	Average per day
	<i>lb.</i>
1945 ..	3.80
1946 ..	5.00
1947 ..	5.15
1948 ..	6.60
1949 ..	7.10
1950 ..	8.20
1951 ..	7.00
1952 ..	8.10
1953 ..	8.80
1954 ..	8.10
1955 ..	7.80

TABLE III
AVERAGE DAILY MILK YIELD PER HEAD AND CALVING PER MONTH IN 1955

Month	Average daily milk per head	Calvings per month
	<i>lb.</i>	
January	8.7	5
February	8.7	8
March	8.6	9
April	9.7	10
May	8.6	13
June	8.6	4
July	7.8	5
August	6.5	10
September	6.8	10
October	6.6	8
November	6.9	11
December	6.6	12

VIII. Annual Report—Section of Botany and Pathology

Summarised by J. D. JAMESON, O.B.E. Chief Research Officer

GENERAL REVIEW

600. New staff recruited under the Development Plan started to arrive towards the end of the year, although no appointment to the post of Senior Botanist had been made at the end of it. Much time was spent drawing up plans, and the building of the new pathology laboratory at Kawanda was completed. But the tempo of work had only just started to increase when the year ended.

601. The Specialist Committee on Agricultural Botany (E.A.A. F.R.O.) met at Kawanda in October and was attended by 33 members and observers. The main theme was perennial crops and there was a most profitable discussion on coffee.

CEREALS

Maize

602. A series of maize variety trials was organised throughout East Africa by E.A.A.F.R.O. to test the possibility that the land races which have developed in different areas might be re-distributed to better advantage. These trials were not completed by the end of the year because the seasons are not the same in all places, but there was some indication that certain types developed in Tanganyika might be useful in Uganda.

603. The transference to local maize varieties of resistance to *polysora* rust proceeded at Kawanda, but the programme was modified in the light of the knowledge gained by Dr. Storey at E.A.A.F.R.O. headquarters that two races of the rust exist (potentially many more) and that two genes for resistance are available for transfer.

604. Work also proceeded on the production of synthetic maize varieties by Lonnquist's method.

Sorghum

605. A review was completed at Serere of the place of sorghum in different agricultural systems. The main problems in the crop were short listed as (a) birds, (b) stalk-borers, (c) storage pests.

Finger Millet

606. Interesting light was thrown on the wild head ("ekitu") problem. Information kindly provided by the Director of the Royal Botanic Gardens, Kew (personal communication) suggested that there are two important wild species in Africa, a diploid species *Eleusine indica* in the coastal and humid areas, and a tetraploid species *Eleusine* *sp. nov.* in the

savannah areas. Both occur in Uganda, the latter being "ekitu". But only the former occurs in India, where wild heads are not reported as a problem in the crop. If the tetraploid species is postulated as the progenitor of the crop, *E. coracana*, which is a tetraploid, then Africa and not India emerges as the centre of origin of the crop, and the occurrence of a range of hybrids in the crop in Africa is explained.

607. The practical importance of this hypothesis in Africa may not be great but it becomes important to avoid making an unwitting introduction of the tetraploid species into Asia.

Rice

608. Fifteen varieties selected for resistance to blast disease at Kawanda have been forwarded to Mbale for testing in the area where most rice is grown.

BANANAS

609. Panama disease was reported from two new areas, Toro in the west, and Bugisu in the east. It is now unlikely that any banana growing area is sufficiently free from this disease to warrant any special precautions concerning the internal movement of material for planting.

610. The relative susceptibility of the sweet and roasting types as compared with the green banana has been noted on a number of occasions, but as yet no formal data can be presented.

COFFEE

611. The E.A.A.F.R.O. Specialist Committee discussed at length the important question of self-incompatibility in the diploid species, and its bearing on the breeding of *Coffea canephora*. At the end of the year a coffee research unit was set up within this Department, with the task of framing a new and more vigorous programme of research. The new station for robusta coffee in Kyagwe has to establish a water supply before building can start, and that for arabica coffee on Mt. Elgon awaits a solution to the local problem of *Simulium neavei*, which is being pursued by the Medical Department.

COTTON

612. The variety B.P.52/N.C.54 bred by the Empire Cotton Growing Corporation at Namulonge offers the promise of a remarkably good yield on some 200 acres of land at the Bunyoro Agricultural Company's farm at Kigumba in the Western Province.

613. In the Eastern and Northern Provinces this Department's variety DE715/6 has achieved yield, resistance to blackarm and wilt, and freedom from seed-coat neps, but its spinning quality is in question. The Empire Cotton Growing Corporation will post an officer to Serere in 1956, when the responsibility for cotton breeding in this area will be handed over.

614. All 12 seed dressing stations were in operation and for the first time all seed for planting throughout Uganda was dressed with *Perecot* or *Armasan* dust. The annual survey did not reveal any main-stem infection rate higher than 15%, whereas formerly figures of 50% or more were frequent.

SUGAR

615. An enquiry into the origin of the varieties which have proved to be commercially successful in Uganda revealed a very close relationship between them and suggested that breeding for a 12-hour day may be an important consideration.

616. By the end of the year stocks of material free from ratoon-stunting disease had been built up at Kawanda to the point where it could be released in bulk to the estates.

617. It has been arranged that all new varieties released from the E.A.A.F.R.O. Plant Quarantine Station are sent to Kawanda for heat treatment against ratoon-stunting disease. This material raised at Kawanda is made available to all research centres in East Africa.

IX. Annual Report—Section of Chemistry

By E. M. CHENERY, Senior Chemist

GENERAL REVIEW

618. Absences of senior staff were even longer in 1955 than in 1954. In spite of this, all the long established lines of investigation were continued and at least three new ones were initiated and pursued to the point of showing results. These were: surveys in Karamoja, the Kawanda pot tests and fertilizer trials on grass production. A new chemist joined the section in October and at once resumed the further study of the mineralisation of nitrogen in Uganda soils. By the end of the year, very substantial progress had been made. The arduous task of statistically analysing yields of four crops on the fertilizer experiments has not yet been completed but summarised below are the most important results of this work but full details will be reported elsewhere, when it is concluded.

SOIL FERTILITY AND PRODUCTIVITY

619. The crop which occurred in most of the fertilizer trials this year was cotton; sunflowers and maize have also been studied, together with a permanent grass ley. Although many of the yield results have yet to be evaluated in detail, especially those relating to the cotton now being harvested, the general picture which emerges is not too encouraging. Difficulties have been found in past years in the endeavour to increase yields of cotton by the use of fertilizers, and the present crop is posing for more critical study a new range of problems. Some yield increases have been obtained but not always under conditions where they were expected.

620. The nitrogen and phosphorus trials which were commenced in 1953, began their second circuit of the rotation in 1955. Nine of the original trials at scattered sites throughout the country are still continuing but at two of these sites it is clear that there are other factors additional to nitrogen and phosphorus now limiting yields of cotton. At Katakwi for example, although responses were obtained with these two macro-elements, pot tests have indicated the need for some trace elements. At Bulopa, too, poor yields have been obtained and this might be attributed in part to water-logged conditions during the earlier life of the cotton crop, caused by heavy rain being unable to drain away through an impermeable ironstone pan. It is possible that trace element deficiencies may also occur here. At other sites where no obvious differences were visible in early growth, differences in yield are unlikely to be large. It would appear, however, that double superphosphate at 1 cwt./acre

placed at seed level but two inches to the side, at planting time, is tending to depress yields. The same quantity of phosphate broadcasted has had a slight beneficial effect in some cases, and it is possible that the 2 cwt./acre of sulphate of ammonia may also give slight yield increases. These trials which have now carried cotton, finger millet, beans (or cow peas in the drier areas); then approximately six months weed fallow followed by the present cotton crop, have shewn that on the poorer soils in the north, some yield increases by the use of phosphates and sulphate of ammonia reapplied to every crop, may be obtained.

621. In the south, the richer red soils have not given worthwhile responses, except in certain circumstances not yet clearly understood.

622. In relation to this last remark the present cotton crop at Kawanda is significant. One trial on old land gave a control yield of approximately 340 lb./acre of cotton when planted at the end of June. The crop matured early and picking, completed in January, shewed that sulphate of ammonia caused a yield increase of around 250 lb./acre when it was applied at 2 cwt./acre, either at planting time or at first budding. Application at flowering produced a slightly lower yield increase. Similarly a dressing of 2 cwt./acre of double superphosphate mixed with 48 lb./acre of sulphate of potash applied at planting time, which gave a very markedly more vigorous plant, led to a yield increase of around 70 lb./acre of seed cotton; thus the best treatment outyielded controls by 350 lb. of seed cotton per acre, i.e. the basic yield was doubled. On the other hand on better land the effect of applied sulphate of ammonia was not nearly so marked. The cotton matured over a longer period, and other than the depressive effect noted above, due to placed phosphate in one trial, the only noteworthy difference in picked cotton was in a trial where sulphate of ammonia was applied in the presence and absence of a grass mulch. Here, on a good soil, nitrogen alone increased the yield by 100 lb./acre, mulch alone by 250 lb./acre and the two applied together by an amount in excess of 250 lb./acre. These figures relate to the position when 750 lb./acre of cotton had been picked from the control plots, although there was yet still much cotton to be picked. The eventual results of the treatments are likely to be even greater.

623. This beneficial effect of mulch and sulphate of ammonia was also found in the three other trials of similar design, sited elsewhere in the Protectorate. It is unfortunate that mulching is economically unsound but attention is being given to cheaper methods. It is worth mentioning here that again at Kawanda in the classical nitrate experiment, plots which have had an entire grass mulch since 1949 are now producing very late maturing cotton, shewing extreme nitrogen deficiency. If the picking is continued late, then, as is 1954, the cotton yield on the mulch plots would be satisfactory. But in 1955, where the unmulched cotton matured early, extending the picking to get the value from mulch is unlikely to be economic. At present the mulched plots have produced only 20% of yield of those unmulched, these latter now having given around 500 lb./acre.

624. At Serere the Chloris trial described in previous reports carried an early cotton crop at the end of its three year period of cropping. Double superphosphate at 2 cwt./acre was applied at planting, but due to an error was placed as a band on the soil surface, while 2 cwt./acre of sulphate of ammonia was applied as a surface side band two months later. One would have expected yield responses in this trial to have been marked, especially since losses due to insect damage were reduced by application of insecticides. However, a good crop averaging 1,000 lb./acre of seed cotton was picked and no treatment effect was of any consequence. Thus even on the argument that the surface applied phosphate was useless, the lack of response to residual phosphate previously applied was somewhat disappointing.

625. Finally a trial at Kawanda on a permanent grass ley shewed once again that grass will respond very well to sulphate of ammonia. A nearly fourfold increase in green matter was obtained from dressings up to 80 lb. per acre of nitrogen, and a pasture which was previously useless, produced in November and December very valuable dry season grazing.

626. Because fertilizer responses in the past have given greatest indication of economic value on crops growing in the light soils of north and east Uganda, trials will, in future, be concentrated there and will be directed from Serere. On this Experiment Station, experiments will be initiated to assess the value of other forms of nitrogenous and phosphatic fertilizers with special attention to placement techniques.

627. Sulphate of ammonia was the source of nitrogen in the majority of past trials, it is of importance now to discover whether the beneficial effect of this material is due to its sulphur content or to the nitrogen it provides or due to both elements.

628. Work in the south on the red soils will be continued, with greater emphasis on trace element deficiencies in worn-out soils. Liming has not received much attention in the immediate past, due to the fact that the few experiments which included it gave disappointing results, and that very large yield increases would be required to pay for what is undoubtedly one of the most expensive soil amelioratives in Uganda. But there is now evidence that low cotton yields on "worn-out" soils are closely connected with soil acidity. On unfertilized plots at Kawanda cotton just will not grow if the reaction is below pH 5.2.

SOIL CHEMISTRY

629. From the foregoing, it is apparent at a glance that the improvement of crop production by fertilizers is still by no means certain but the problems faced are now more clearly defined. The importance of soil nitrate fluctuation in this connection was appreciated as far back as 1948 and was considered so great that a long term nitrate experiment was initiated at Kawanda. The results of this work have been outlined in previous annual reports but no final conclusions have been made. Two

divergent aspects of this study were emphasised by the late Dr. E. M. Crowther and Dr. Jane Meiklejohn at the Muguga Soil Fertility Conference of 1953⁽¹⁾ but lack of staff precluded following them up. Dr. Crowther held the view that the high nitrate contents of Uganda soils were due to capillary uplift and Dr. Meiklejohn that some unusual microbiological factor was responsible; Kawanda's view was that both factors were significant. The task is to sort out both physical and biological factors and progress is reported as follows.

Mineralisation of Nitrogen

PHYSICAL FACTORS—UPWARD MOVEMENT OF NITRATE

630. "An experiment was laid down on a small area adjoining the nursery plots at Kawanda to determine the relative importance of bacterial nitrification and upward movement of nitrate in providing surface accumulations on bare plots during a drying-out period. Six pairs of plots were prepared, of which one plot in each pair contained a galvanised metal sheet 3'×3' inserted horizontally at a depth of three inches to prevent upward movement. The other plot of the pair was similarly prepared but did not receive the metal sheet—so acting as a control. Sheeted and unsheeted plots were randomised in N-S orientation. Small samples (0-3") have been taken at 4-7 day intervals throughout December and January, and analysed for ammonia nitrite and nitrate. As yet, owing to a somewhat abnormal season, insufficient drying-out has occurred to produce large nitrate accumulations. However, continual fluctuations in nitrate status have been observed, from complete washing out of nitrate after heavy rain to subsequent regeneration after drying. Nitrate has remained insignificantly low and ammonia has shown a slight tendency to fluctuate in the same direction as nitrate, the change being greater in unsheeted than in sheeted plots. The trial will be continued until the end of March and if necessary will be converted to an indoor (greenhouse) experiment.

SOIL COLUMN EXPERIMENTS

631. Preliminary experiments have been carried out in the laboratory on the accumulation and movement of nitrate ions towards distinct sections in columns of moistened soil. Columns have been prepared of well-mixed, air-dried surface soil (0-6" samples) from the Kawanda nursery plots. Soil passing a 2 mm. sieve was carefully loaded into alkathene tubes which were then erected vertically and irrigated from below. After irrigation with water or nitrate solutions, the columns were incubated in the dark at 30°C. for a fixed period of time when dissembled and dissected into two inch portions. Nitrate, nitrite and chloride (when added) were determined in each sample. It was found that a high concentration of nitrate accumulated in the top two to three inches after water or nitrate irrigation. In columns containing soil which had been partially moistened during mixing before preparation, it was found that

(1) E. Afric. Agric. J. (1952) XIX. 19-57.

the nitrate ascending during irrigation came up as a front of high concentration. Under these conditions (12 days incubation, irrigation with nitrate at 700 p.p.m.N) high concentrations of nitrite were formed; these concentrations did not occur in the presence of 0.002 M potassium chlorate. Sterilisation of the soil before making the column did not effect nitrate accumulation but the incubation time and original nitrate concentration were not appropriate for bacterial nitrate production. Together with the nitrate, chloride (as an inertion) was added to certain columns, to detect drying out and amounts of water movement. Little drying out had occurred during the 12 days.

632. A more satisfactory procedure has now been devised with larger columns, 22" long, containing 700 g. air-dried soil. Irrigation has been achieved from above and below to an overall 20% moisture. A lower nitrate concentration and appropriate replication have been used. The next stage will be to irrigate the columns with dilute solutions of ammonium sulphate from below, from above, and also before loading the column, then to follow the pattern of nitrate accumulation during further irrigation.

INCUBATION EXPERIMENTS

633. The standard method which previously has been widely used to determine the nitrogen-supplying power of soils is an incubation of the soil at a fixed moisture content and determination of the nitrate formed after a fixed period. Cornfield⁽¹⁾ has studied the effect of added calcium carbonate on the formation of ammonia, nitrite and nitrate during incubation. Samples from Kawanda nitrate plots which were known to be of low pH and low total nitrogen have been used together with samples from a high nitrogen plot (Kawanda nursery) to test the suitability of the incubation method for determining nitrogen mineralisation (formation of ammonia, nitrite and nitrate) in local soils.

634. Preliminary incubation was performed in the nitrate plots soils with 10% moisture plus 0.17% calcium carbonate and in some cases an added 21.2 p.p.m. of $\text{NH}_3\text{-N}$ as ammonium sulphate. It was found that all these soils nitrified extremely slowly, producing only 6-8 p.p.m. of $\text{NO}_3\text{-N}$ after 13 days. The ammonia status remained approximately constant in the case of samples from plots 5, 10 and 18 which were unmanured and shaded, bare and uncropped; bare and cropped respectively from 1949 to 1954. The only sample to show an ammonia accumulation was from plot 12—mulched and uncropped from 1949 to 1954—which showed a net increase of 38 p.p.m. $\text{NH}_3\text{-N}$.

635. In a second experiment at 16.7% moisture, using samples from nitrate plots 5, 10 and 18 from Kawanda Nursery, mineralisation of nitrogen was examined after 13 days incubation at room temperature

(¹) Cornfield A. H. (1952) J. Sci. Food and Agric. (1952) III. 343-349.

in the dark. Ammonium sulphate (47 p.p.m.N) was added to half of the total number of the samples; water was added to the rest. Duplicates of each soil received calcium carbonate as a powder at 0.17%, 0.83% and 4.2% dry weight and were thoroughly mixed before wetting. In the absence of added ammonia, it was found that an excess of calcium carbonate (4.2%) more than doubled the nitrate production with the 0.17% level in the case of the richer nursery plot soil, but it had no effect on the negligible nitrate production of the nitrate plot soils. Also 4.2% calcium carbonate produced an accumulation of ammonia in the poor nitrate plot soils of 25–36 p.p.m.—this was not converted to nitrate. Nitrates were negligible in all cases. Table I shows the results obtained when ammonium sulphate was added. The outstanding nitrification of the richer soil is shown and on the other hand the ammonia accumulation in the poorer soils is again pronounced.

TABLE I

Origin	Initial pH	Treat- ment	0.17%	CaCO ₃	0.83%	CaCO ₃	4.2%	CaCO ₃
			*NH ₃ -N	NO ₃ -N	NH ₃ -N	NO ₃ -N	NH ₃ -N	NO ₃ -N
Nitrate plot 5 ..	5.03	Shaded	52.3	15.4	37.1	6.5	33.2	9.2
" " 10 ..	4.89	Bare	46.5	6.2	53.2	3.7	89.5	5.6
" " 18 ..	4.81	Cropped	32.6	16.8	33.9	15.4	67.8	12.4
Nursery plot ..	5.69	Newland	12.1	72.6	7.9	80.3	2.1	80.8

*Found after 13 days incubation in each case.

DETECTION OF MICRO-ORGANISMS AFFECTING THE NITROGEN STATUS OF DIFFERENT SOIL TYPES

636. As the first stage in a general survey of the importance of nitrate-producing and nitrogen-fixing bacteria in the soils of the Protectorate, a group of 14 soils from sites in Kigezi, Toro, Mengo, Bugisu, Teso, Karamoja and Lango were examined for their activities in producing cultures of the appropriate micro-organisms. Culture media suitable for the growth of the two nitrifying organisms, *Nitrosomonas* and *Nitrobacter* and for the nitrogen fixer, *Azotobacter*, were inoculated with small samples of each soil. Two soils of volcanic origin from Bugisu and Napak (Karamoja) were found to be remarkably rich in both nitrogen-fixing and nitrate-producing organisms. A swamp clay from Serere, a red volcanic soil from Sipi (Elgon) and a red forest soil from Namyoya were also rich in nitrate-producers but N-fixing organisms were not abundant. On the other hand, soils from Mutufu (Elgon alluvium) and Ngetta (acid light loam) were rich in N-fixing organisms but poor in nitrate-producers. Two very acid soils from Kigezi and a sodium-rich clay from Semliki Flats did not give cultures of nitrogen-fixing nor nitrate-producing organisms. If these preliminary tests are a true indication of the population of each organism in these soils, quite contrasting situations exist. Experiments are being designed to follow the changes in total-N status in these soils."

637. As nitrogen is only one of 13 essential elements that are obtained from the soil and any one of these might be a limiting factor in crop production, it was decided to intensify the study of deficiencies of all elements by means of pot tests.

POT TESTS FOR MAJOR AND MINOR ELEMENT DEFICIENCIES

638. The pot tests mentioned in last year's annual report were further developed and extensively used during 1955. The principle of the method appears to have been evolved in America as long ago as 1923 by Garner, *et al*⁽¹⁾ and later in 1933 was used successfully by Storey and Leach⁽²⁾ in their study of Nyasaland tea yellows. In the technique recently published by Webb, ^(3, 4) 12 elements were studied instead of two or four as in the original method. A few practical improvements have been made to Webb's procedure which have resulted in more tests being carried out with the limited resources available at Kawanda. These were—

1. Growing the plants for a shorter period of only five to six weeks in smaller containers; these were originally drinking glasses but are now tins (3" × 4½" with $\frac{3}{8}$ " holes) lined with alkathene film.

2. The omission of iron from all culture solutions to avoid precipitation with phosphorus.

3. Watering for a week all plants except the controls and no-nitrogen treatment, with sodium nitrate solution (20 p.p.m.N) in order to inhibit overall N. deficiency symptoms which tended to occur on certain soils.

4. Liming soils which would not grow tomatoes (i.e. soils with pH values below pH 5.0 or else using soya beans as the test plant in these soils.

639. Cotton was also tried as a test plant for a poor soil from Block I, Kawanda. Acute nitrogen deficiency showed up within the first month and by the end of three months the effects of lack of phosphorus, sulphur, potassium, calcium and combined trace elements were all strikingly apparent. The high magnesium-supplying power of this soil was noteworthy as the content of exchangeable magnesium here is low, on temperate climate standards.

640. Sixteen soils were examined, entailing over 900 plants being subjected, in all, to the 14 treatments. In every soil serious shortages of major and often of minor elements were revealed but it must be stressed that the deficiency syndromes are magnified because root-room is restricted to 400 grammes of soil. The nature of the shortages are, at least, clearly displayed together with a rough idea of their severity. The results for each soil tested are described separately below:—

(¹) Garner, W. W., McMurtrey, J. E., Bacon, C. W. and Moss, E. G. (1923) J. Agric. Res. XXIII, 27-40.

(²) Storey, H.H. and Leach, R. (1933) Ann. Appl. Biol. XX, 23-36.

(³) Webb, R. A. (1954) Trans. V Congress Soil Sci. III, 214-217.

(⁴) — (1954) Proc. 2nd Int. Afr. Soils Conf. I, 417-424.

SERERE

641. The long term Fertility Experiment has abundantly demonstrated the value of natural fallow and of small dressings of farmyard manure in maintaining productivity. In order to pin down the beneficial factor or factors, a preliminary investigation by the pot technique was run on the soil from ten plots receiving five treatments.

TABLE II

	4 YEARS CROPPING			2 YEARS CROPPING		Means
	1 year Chloris		1 year N.R.	3 years Nat. Regen.		
	F.Y.M. ₀	F.Y.M. ₅	F.Y.M. ₀	F.Y.M. ₀	F.Y.M. ₅	
<i>Treatments:—</i>						
Complete Nutrients ..	100	100	100	100	100	100
Water only ..	3.2	3.2	3.8	1.6	3.1	3.0**
Complete minus Nitrogen ..	3.5	10.9	13.2	2.1	3.5	6.8**
" " Phosphorus ..	5.6	3.7	3.7	3.2	11.2	5.4**
" " Potassium ..	59	58	68	64	52	60
" " Sulphur ..	43	50	62	30	35	44*
" " Calcium ..	48	41	61	40	33	44*
" " Magnesium ..	82	62	87	60	64	70
" " Manganese ..	71	52	80	68	62	66
" " Molybdenum ..	103	73	68	76	69	78
" " Copper ..	56	48	72	45	50	53
" " Boron ..	100	66	80	63	70	75
" " Zinc ..	53	37	50	39	39	43*
" " Mn, Mo, Cu, B, Zn.	64	38	62	43	37	44*
Cover when sampled	Cotton			<i>Imperata cylindrica</i>		

Acute deficiencies are indicated by 0-10% **.

Severe deficiencies are indicated by 11-50%*.

Moderate deficiencies are indicated by 51-80%.

642. These figures are certainly unrealistic when applied to other crops besides tomatoes, but the general indications of deficiencies are probably real enough. It would thus not be too ambitious to set as a target for fertilizer responses the doubling of present yields. The beneficial effects of farmyard manure would seem to be due to the macro-elements nitrogen, phosphorus and sulphur. The increased yields in the field from the manure apparently depleted the limited reserves of the minor elements. When columns one and three are compared, the superiority of the natural regeneration (*Imperata cylindrica*) is evident in a threefold improvement in nitrogen status, together with better copper and sulphur-supplying ability. The relatively good molybdenum status of the Chloris plots warrants further investigation.

BUGUSEGE COFFEE STATION

643. The soil studied was taken from Block H where the coffee has always been most unsatisfactory. The brown soil here is rather anomalous in being both base-rich and acid, due to the nature of its constituent clay mineral (montmorillonite). For comparison, a sedentary red volcanic soil from near Sipi Falls and a red volcanic alluvial soil from Mutufu Prison Farm, were similarly tested.

TABLE III

Treatments	Bugusege	Sipi	Mutufu
Complete Nutrients	100	100	100
Water only	4.6	11.2	0.16
Complete minus Nitrogen	5.0**	8.2**	3.6**
Complete minus Phosphorus	82	88	95
Complete minus Potassium	83	117	108
Complete minus Sulphur	30*	32*	0.44**
Complete minus Calcium	50	80	51
Complete minus Magnesium	84	110	97
Complete minus Manganese	78	113	100
Complete minus Molybdenum	96	76	64
Complete minus Copper	74	57	78
Complete minus Boron	88	98	87
Complete minus Zinc	79	18*	58
Complete minus Mn, Mo, Cu, B, Zn. ..	78	62	58

644. It is clear that all these volcanic soils are suffering from acute deficiencies of nitrogen and sulphur (the sulphur shortage in the Mutufu sample was extremely acute). The fact that these soils are so well supplied with potassium and magnesium together with phosphorus may accentuate nitrogen deficiency in the field. The copper and zinc deficiencies are probably real and will be studied further. Fertilizer trials with sulphate of ammonia and gypsum should show considerable beneficial responses.

BUGANDA LUNYU SOILS

645. The soils investigated were: the notoriously infertile soil from Kagongo Farm, soils from unmulched and mulched plots in the Buwunga Phosphate Experiment and two worn out soils from the R.S.P. Experiment on Block I Kawanda. Growth was so slow on the Buwunga soils for the first three weeks and purple coloured leaf reverses showing in all treatments that excess acidity was suspected. This would induce phosphorus deficiencies through the excessive availability of aluminium which precipitates phosphorus within the root hairs. All pots were accordingly treated with lime water (the no-calcium plants received magnesia water) and growth soon became normal.

TABLE IV

Treatments	Kawanda		Buwunga		Kagongo
	Control	High S/A	No Mulch	Mulched	Pasture
Complete Nutrients	100	100	100	100	100
Water alone	7.5	2.3	2.5	1.1	4.7
Complete minus N	52	96	3.7**	15	9**
Complete minus P	15	1.1**	9**	7**	7**
Complete minus K	94	106	106	108	60
Complete minus S	84	36*	102	137	19*
Complete minus Ca	109	124	34*	84	102
Complete minus Mg	77	83	47	66	91
Complete minus Mn	85	59	67	100	84
Complete minus Mo	111	74	88	70	84
Complete minus Cu	79	74	88	70	84
Complete minus B	101	93	76	81	84
Complete minus Zn	103	82	61	85	92
Complete minus Mn, Mo, Cu, B, Zn.	100	93	58	83	96

646. The widespread occurrence of acute nitrogen and phosphorus deficiencies are amply confirmed. The sulphur figures for Kawanda are not what was expected in view of the heavy (one ton per acre over five years) applications of sulphate of ammonia to the second soil. It seems that the sulphate ion is leached out very rapidly and the ammonium ion is absorbed into the clay crystal lattice from which it is released slowly to the plants, via nitrifying bacteria. On the other hand, plants receiving no sulphur in the Buwunga soils were consistently greener and larger than others. This is readily explained by the fact that plots from which these soils have been taken, had received five years previously 15 cwt. per acre of single superphosphate. The calcium sulphate in the superphosphate is retained in the soil to a considerable extent and is of lasting benefit to crops. From this series of pot tests, it may be concluded that the infertility of Lunyu soils which is primarily due to excessive soil acidity, is also associated with acute nitrogen, phosphorus and sulphur deficiencies. The latter deficiencies in turn are the result of failure of elephant grass to grow on Lunyu sites. The value of elephant grass leys was discussed in last year's annual report (p. 111). It was further studied this year by applying the pot technique to an extremely fertile soil of known cropping history.

ELEPHANT GRASS SOIL

647. A series of ten composite samples were collected from Nakabango, Busoga, where elephant grass grows luxuriantly and the soil is very highly productive of all crops. Owing to the lack of sufficient soil, only two treatments were applied: water alone and complete nutrients minus phosphorus. The weights of tomato plants from soils of five sites are given in the table below:—

TABLE V
WEIGHTS IN GRAMMES OF OVEN DRIED PLANTS

Site Cover	WATER ALONE			COMPLETE MINUS P		
	Topsoil	Subsoil	Total	Topsoil	Subsoil	Total
3 years cropping ..	2.24 (19)	.018 (0)	2.26	1.95	.013	2.08
2 years cropping ..	2.45 (61)	.046 (4)	2.50	2.60	.056	2.66
$\frac{1}{2}$ year cropping ..	2.35 (38)	.064 (7)	2.41	2.55	.062	2.61
Just burnt ..	2.30 (129)	.067 (5)	2.37	2.72	.025	2.75
Elephant Grass ..	1.65 (35)	.300 (9)	1.95	2.05	.350	2.40
Means ..	2.20 (56)	.099 (5)	2.30	2.35	.101	2.45

648. Despite the lack of replication, trends indicated above are sufficiently consistent to suggest that there is very little run-down in this soil after three years' cropping and what there is is probably due to losses of phosphorus. The most striking feature, which is a very real effect, is the difference in growth between the top six inches and the second six inches on all soils. This is reflected in the figures (in brackets) for available P_2O_5 by Truog's method. There can be little doubt that the source of the reserves of phosphorus in the topsoil was the long-standing cover of elephant grass.

649. The tomato plants grown in the Nakabango topsoil with water alone were equal in size to those of the other test soils receiving complete nutrient solutions. If tomatoes can be equated with cotton then this tends to confirm the productivity target mentioned above. Yields of seed cotton at Nakabango have frequently exceeded 2,000 lb. per acre while the maximum yields of most of the light soils are about 1,000 lb. per acre. It would seem that with a balanced fertilizer mixture, adequate rain and absence of pests and diseases, vast areas at present producing only a few hundred pounds per acre, might eventually equal the best Nakabango yields.

TEA SOILS

650. Sand culture and field experiments designed to demonstrate the essentiality of aluminium as distinct from iron to the tea plant showed no benefit from aluminium but about 100% increases in the dry weight from the iron, both metals being applied as versenates. Three sand culture experiments with up to eight levels of potassium confirmed a field observation, *vide infra*, that too much potassium was bad for young tea and may be the cause of failure in over-rich nursery beds and mature gardens. Potassium solutions containing more than about 400 p.p.m. potassium killed tea seedlings within a few weeks.

ROUTINE LABORATORY WORK

651. This was constantly hampered by the presence for six months of builders in the laboratories, and particularly by the lack of gas and electricity, in spite of which, most of the 1,860 samples submitted during the year had at least ten determinations done on them. Some indication of results obtained is given in the next section.

SOIL DISTRIBUTION GENESIS AND MORPHOLOGY

Soil Survey

652. The swamp-land surveys made by Mr. R. H. Gunn of Sir Alexander Gibb and Partners in connection with the water resources survey of the Protectorate were completed by April 1st. Mr. Gunn examined 91 profiles during 1955 and submitted 555 samples. This makes a total of 1,204 samples from 274 profiles and about 10,000 determinations made by the chemistry section for this project. Areas unsuitable for agricultural development were clearly revealed by the laboratory tests for such reasons as excessive acidity, salinity or poverty of soil nutrients. Similarly, areas of high potential productivity were spotted at once by the large reserves of plant nutrients found in the samples.

653. A fairly detailed survey was made of the soils of a large tea estate near Jinja. The main finding of this investigation was that soils were, on the whole, too rich in base content for tea, in spite of having soil acidity within the desired range. The chief factor responsible for tea

failing was excess potassium coupled with a serious deficiency of phosphorus and sub-optimal levels of nitrogen and sulphur. The soils of the proposed site of an Arabica Coffee Research Station at Bufumbo on the eastern slope of Nkokonjeru spur from Mt. Elgon were examined in ten test pits. These were found to be brown montmorillonitic clays similar to Bugusege. Later in the year, Coffee Variety Trial Centres were inspected and the same brown volcanic soil was found. It would appear that this soil is more widespread than was first envisaged on the dissected flanks of Elgon, and that the red soils are confined to the older land surfaces of the upper spurs and terraces and occasional low-lying alluvial fans like those at Mutufu Prison Farm.

654. Kigezi was visited once during the year and soils were examined in the Bufumbiro volcanic field, the gorilla reserve in the Impenetrable Forest, the re-settlement area at Bugangari, and the dark horizon latosols at Kachwekano. The Bufumbiro volcanic soils appear to be of two main type:

1. Derived from pumice-like ash *in situ*.
2. Derived from alluvial fans of comminuted ash.

They are extremely fertile soils containing an abundance of humus (up to 12%), available phosphorus and potash. The alluvial type is remarkable in supporting a fine stand of tea (seed) trees at Maziba despite the fact that the soil has a pH of 6.4 to 7.1. The reason for this tea not failing is probably due to an abundance of organic matter throughout the soil profile which supplies in a chelate form all the iron, manganese and aluminium which the tea trees need. In contrast to these rich soils, those derived from the older rocks into which the volcanos intruded are all extremely poor. They are exceptionally acid in reaction; pH values as low as 2.9 were found in the topsoil of the yellow latosols of the Impenetrable Forest. Such soils are so poor in bases that they would be quite useless for any food crop, but tea bushes would probably flourish if they were fed with nitrogenous fertilizers. Bugangari soils were, on the whole, sands and sandy loams overlying Karagwe-Ankolean rocks or Kaiso pebble beds. They were not well endowed with nutrients but on the other hand they were not too acid for food crops. The tobacco growing project there should do well as these light soils are quite suitable for this crop. The peculiar "dark horizon latosols" which are a common feature of the higher parts of Kigezi were examined in some detail at Kachwekano Farm. They appear to have been closely associated with geo-morphology, particularly angle of slope. They are not buried top soils as they occur very near the tops of some of the higher ridges; they are more likely to be podsolised latosols but much more study would be required before this could be proved.

655. The Botanist Ecologist made extensive surveys in Ankole and Toro in connection with Bakiga resettlement and North Mengo as part of the systematic soil and vegetation survey of the Protectorate. He reports his work as follows:—

Bakiga Resettlement

656. "Reconnaissance surveys of the soils and vegetation of 2,500 square miles of Ankole and Toro were carried out to assess the prospects for controlled settlement. Much of the area surveyed is unsuitable for further settlement involving arable agriculture owing to poor, shallow soils and/or low rainfall. The most promising areas are located in the north and north-east of Kibale County, Toro, and in the highlands of Ngarama, Kashumba and Lugaga gombololas, Ishingiro, Ankole. It was estimated that the areas in Ankole and Toro could take a maximum of 7,700 families—water supply, communications and human factors permitting. It was also recommended that the area in Buhwezu, Ankole, should be studied as a possibility for tea. Seventy-three soil profiles were sampled and much data on the distribution of the soils and vegetation was collected in the course of this work. The information on the vegetation has been incorporated in a revision of the 1: 250,000 vegetation map of Western Uganda.

North Mengo

657. The main objects of the ecological survey of the north Mengo lowlands are to determine the relationships governing the geography of the natural vegetation of this region and to devise methods of survey for the assessment of the land-use potential of both limited areas and broad tracts of country. Approximately 1,000 square miles of vegetation has been mapped on the scale 1: 50,000 and a combined detailed-reconnaissance survey of the remaining 4,000 square miles is now proceeding.

658. The 1: 50,000 maps show the distribution of plant associations characterised by one or more dominant species. While the distributions of the majority of these associations have a good correlation with topography and soil, there are a number of exceptions, not explicable by the action of additional factors. The exceptions have become more obvious by botanical analysis and detailed site description work. Certain associations, for example grasslands dominated by *Loudetia arundinacea*, occur over a wide range of conditions, while others have a restricted distribution determined by one or more factors of the environment. It has been possible, however, to distinguish between various *Loudetia arundinacea* grasslands on the basis of their subordinate species, and it is to be noted that these sub-associations have a high degree of ecological reality.

659. In collaboration with the District Forest Officer the Field Officer in charge began operations in Karamoja in August and compiled a preliminary vegetation map of the whole district on the scale 1: 500,000. He then began the systematic soil survey and collected some very interesting profile samples for laboratory examination. These were the first to be chemically studied from this area and are remarkable in that they all reflect the influence on soil formation of a dry climate over a long

period of geological time. Unlike most other soils in Uganda, these soils, even the red ones, have a base status that increases as the profile is descended. This is due to rainfall being insufficient to leach the soil parent material beyond a few feet of the surface and the vegetation being inefficient as subsoil miners and in building up a stable base-rich topsoil."

Publications

WOOD, G. H. S. and CHENERY, E. M. "Regeneration of *Chlorophora excelsa* (Mvule) in Uganda in Relation to Soil-Root Conditions", E. Afric. Agric. J., (1955) XXI, 34-41.

CHENERY, E. M. Rapid Method for the determination of total Aluminium—in THOMPSON, A., and RAVEN, A. M., "Soil Contamination of Herbage Samples", J. Sci. Food Agric. (1955) VI, 776.

X. Annual Report—Section of Entomology

By A. P. G. MICHELMORE, *Senior Entomologist*

STAFF

660. A second Entomologist and an African Scientific Assistant were appointed during the year but junior assistants have been difficult to obtain. The Senior Entomologist was stationed at Kawanda but was absent for the latter half of the year on long leave. The Entomologist was based on Serere, working on cereal pests. He visited Tanganyika early in the year to compare notes with colleagues working on the same problem, which seemed simpler there. The Insecticide Research Mechanic and the Assistant Agricultural Officer were stationed at Kawanda but travelled in connection with cotton and coffee insecticide work. The new Entomologist and Scientific Assistant were temporarily stationed at Serere on arrival in order to help with the cotton trials and gain experience.

LOCUSTS

661. The Red and Migratory Locusts were absent. The former is being controlled with some difficulty in its outbreak areas in Rhodesia and Tanganyika by the international organisation to which Uganda subscribes. The latter is being kept well within its bounds in the Niger swamps by another international service, also supported by us.

662. Little has been heard of the Kagera Dwarf Locust, *Faureia milanjica* Karsh., of the south-west. It is uncertain whether swarms have actually decreased or if it has not been reported because it is now realised not to be a serious menace to crops.

663. The Desert Locust, *Schistocerca gregaria* Forsk., was present intermittently. There were a few odd swarms in the east in February and March but no damage. A small invasion of the Western Province from the south in April moved up north, one swarm crossing into the Sudan in May. The others disappeared without breeding. There was some damage on occasion to crops, including cassava, sweet potato, sesame, tobacco, beans, peas, maize and "millet" (? Eleusine). In September a single swarm entered Karamoja from Kenya. In October there were two records of swarms and several of isolated locusts in the Northern Province. A spell of dry weather in November gave rise to the biggest invasion of the year. Some swarms were immature, others beginning to mature. All three districts of the Eastern Province were affected, as was Karamoja. In the latter half of November many of the swarms flew west through Acholi, Lango, northern Bunyoro and West Nile Districts. On several occasions during this month, light to considerable local damage was done to crops, including sorghum, cassava, cotton, cow peas, sweet potato,

rice, finger millet and sesame. With wetter weather in December activity decreased. A few small swarms were present in the north-west in the first half of the month. There were also a few records from the Eastern Province. Buganda Province, seldom invaded, produced these records from its northern half. Very little damage was done to crops during this month.

664. For some years it had been becoming clear that Uganda was contributing funds to the Desert Locust control campaign out of all proportion to the damage which she was liable to suffer. Evidence for this view was presented to the Commission on the Desert Locust Control in May.

INSECTICIDAL MACHINERY INVESTIGATIONS

665. The year's work included application of insecticides to the coffee, cotton and maize crops, together with miscellaneous machinery trials.

SPRAYING MACHINERY

666. For spraying coffee against leaf rust, *Hemileia*, one model of pneumatic knapsack sprayer (termed type 'A') had the highest trees/man/hour rating of all, and doubled the rating of most types tested. Important features of this model were that it was pressure retaining, had lance valve gripping off, and could be recharged by dual purpose pump in one minute. Experience with many pneumatic knapsack sprayers throughout the year confirmed that type "A" was supreme for efficiency of leaf coverage, as well as for sturdiness, reliability, simplicity of design and neatness of appearance, whilst price variations between types were negligible. It was found that for complete under leaf coverage on arabica coffee a bamboo lance 5' in length was ideal.

667. Hydraulic applicators with cranking pumps required two operators as against one for the pneumatic type, resulting in higher labour costs. The side cranking handle fitted to many models of hydraulic knapsack sprayers caused the operator acute discomfort, and a cranking handle fitted to a centrally positioned pump, and passing over one shoulder of the operator, was found to be much preferable.

668. A type of cheap syringe knapsack sprayer was preferred for use by African coffee cultivators for applying fungicides to a hand sprayer recommended in Tanganyika Territory because of lower price, higher capacity, continuous action and equal sturdiness.

669. Various other patterns of spray applicators were tested and a small, but unfortunately expensive, hand siphon was found to be unrivalled for test spray applications where a small, highly concentrated, well atomised spray was required.

DUSTERS

670. Hitherto rotary blowers have been preferred, but the year's work demonstrated that a knapsack bellows type might well prove superior

eventually. Bellows dusters previously examined were of very poor construction and performance, but two recently obtained models are highly promising. With two exceptions rotary blowers have developed mechanical faults requiring major repairs.

671. No model of siphon type duster has yet been obtained which outclasses that selected in 1953 for coffee work in Bugisu District. This type is regrettably no longer in production, and strenuous efforts are still being made to find a manufacturer prepared to re-produce it.

672. A simple bellows type hand duster proved very suitable for application of dusts to cereals and cottons by small-scale cultivators.

673. A simple hand shaker duster was designed and made from discarded tins to meet the specific requirement of the Entomologist engaged on cereal pest research.

DRIFT SPRAYING AND DUSTING

674. This was the first year in which drift sprayers were available for testing. Two new drift dusters were also obtained. The work on drift applicators has been largely concerned with modifying and improving construction. Two set trials were carried out, one on cotton and one on coffee, in conjunction with Dr. Rayner of the Jacaranda Coffee Research Station in Kenya. Very useful experience and information were obtained from both these trials and enabled a plan to be developed for further modifications. It is hoped that 1956 will see at least two of these machines developed to an extent where formal trials can be made to determine the relative effectiveness of this type of applicator in comparison with row crop or knapsack sprayers. An essential feature of such trials will be the determination of a cost/time factor. This type of applicator has considerable possibilities where large acreages of crops are grown.

STANDARDIZATION

675. As a result of extensive trials over the last few years, the stage has been reached where appropriate equipment for use against various crop pests in Uganda can be recommended. The selected models include:—

- A tractor-drawn boom sprayer.
- A pneumatic knapsack sprayer.
- A hydraulic knapsack sprayer.
- A syringe knapsack sprayer.
- A siphon flit pump.
- A rotary dust blower.
- A bellows knapsack duster.
- A bellows hand duster.
- A lance and various patterns of nozzles.

INSECTICIDAL CONTROL OF *Lygus Vosseleri* POPP. ON COTTON

676. The investigation of *Lygus* control, started in 1945, was continued. Experiments were confined to a repetition of the Cotton *Lygus*

Spraying Period Experiment at Serere, using McKinlays one-line technique. The treated lines were sprayed to run-off with a 0.2% D.D.T. paste formulation twice a week for different periods, the longest being for 16 weeks. These treatments are, of course, not economic, but are designed to measure the effects of as complete control of insects as possible over different periods. The most effective treatments only reduced *Lygus* damage to the foliage by half, yet the yields were nearly three and a half times those of the unsprayed plots, approximately 450 to 1,550 lb. of seed cotton per acre. In previous years the best treatments have about doubled the yield. It has now been amply proved that spraying for the middle periods, about September and October, produces the best results. The exact period varies a little from year to year with the time of the main *Lygus* attack. August and November sprayings add little advantage, and the complete series may even depress yields slightly. The cause of the latter phenomenon is being studied.

677. Spraying of cotton against *Lygus vosseleri* has now been accepted as a routine measure on the large farms of Serere and the Bunyoro Agricultural Company. On the latter the great flush of opening bolls was an embarrassment and made the fields a sheet of white, which the tenants were unable to pick before much of it was spoiled by rain. By contrast certain unsprayed blocks produced hardly anything, as a result of *Lygus* followed by severe *Helopeltis*.

678. The quick maturing of the crop after spraying is as important as the greatly increased yield. It could enable the picking to be finished earlier, so that the dead season could be lengthened and pests and diseases reduced in the following season. Quicker maturity also normally avoids much of the damage done by such pests as stainers and pink bollworm, which increase as the season advances. Another advantage is that a few big picks use less labour than a long drawn out series of small picks though admittedly the pickers may be hard worked at the height of the picking season. In any case, Uganda cotton growers are said to have become habituated to the former.

679. A possible effect of spraying is that in some years the harvesting of the quicker maturing crop may be impeded by late rains. Looking into the future a quick maturing sprayed cotton would be easier to harvest by machine than the present strains with their extended harvesting season caused by *Lygus* attack.

680. The extension of spraying to peasant cotton has survived the important step of making the growers contribute towards the cost, instead of having it done free. The insecticide was provided free of cost, but a charge was made for the use of the machines, which were all knapsack sprayers. The cotton was sprayed three or four times at ten-day intervals with six to 12 gallons an acre of D.D.T. emulsion in water at the rate of one lb. technical D.D.T. per acre per application. Taken as a whole the improvements were not spectacular, but where conditions were favourable, the results were good, and owners of plots and visitors were reported to be impressed and anxious to continue next season. The most successful

areas are the Masindi and Lango-Acholi border areas where respectively 17 and 25 acres were sprayed. A new trial area was started astride the Lwere River on the Teso-Bukedi border, ten acres being sprayed. The trial areas in Singo county of Mengo and at Busoga Farms in south Busoga have been abandoned as unprofitable.

INCIDENCE OF COTTON PESTS

681. *Lygus vosseleri* was severe in 1955, a fact which explains the unusually good response to spraying at Serere. *Helopeltis bergrothi* was unusually common. Symptoms of light attack were widespread at the end of the season, and there were devastating local outbreaks, notably in Bunyoro, Bukedi and Busoga. Stainers (*Dysdercus* spp.) were perhaps rather later than usual on the cotton. The American bollworm (*Heliothis armigera* Hb.) which seems to have been commoner in recent years than formerly, probably owing to the increase of maize, was not particularly in evidence. Other pests took their usual toll. A new and unidentified caterpillar was reported boring cotton stems on the Teso-Bukedi border.

BOLL ABORTION

682. The large number of bolls aborted on cotton plants late in the season has long been characteristic of Uganda cotton. Many of them were formerly due to blackarm, but the great diminution of this disease due to seed dressing has shown how much of this sort of damage is still done by insects. In many areas it is common to find an average of one large boll per plant completely mummified, while other bolls have one or more locules ruined. The majority of these spoilt bolls and locules have been found in late years to have bollworm holes. Even if the old rule of thumb estimate, that a boll per plant represents 100 lb. seed cotton per acre, is an exaggeration, it is clear that this one form of damage by bollworms causes considerable loss to the industry. Coming late in the season, as it does, the loss cannot be made good by subsequent growth, unlike the damage done by *Lygus*. The somewhat scanty observations on this subject, which have been possible in recent years, should lead to more intense research, as soon as staff is available.

COTTON SEED BUGS, *Oxycarenus* spp.

683. The Scientific Assistant studied *Oxycarenus* in the latter half of the cotton season at Serere. *O. dudgeoni* Dist. was commonest on cotton and less so on *Sida carpinifolia*, *O. fieberi* Stal preferred *Sida* to cotton, and *O. rufiventris* was found mainly on *Hibiscus*. The bugs fed mainly in the heat of the day and mated chiefly in the cool of the morning and evening. The life cycle took four to five weeks. Males were sometimes much commoner than females. The first two nymphal stages are delicate and are apparently often killed by heavy rain. A Reduviid bug, *Nagusta* sp., ate *Oxycarenus* but was not common enough to exert much control. *Oxycarenus* is gregarious. The adults rarely fly, and cotton fields are invaded from the edges. When the cotton is picked most of the bugs

are carried off the field in the seed cotton. No evidence was found of the bugs staining cotton lint, unless their bodies were crushed in the gin. This is normally avoided by the cotton being stored for at least a few days before ginning. By sucking cotton seeds the bugs reduce germination. There is some evidence that it is mainly the third to fifth stage nymphs which do this damage. It may be reduced by burning of crop residues to kill the bugs left at the end of the season, by clean weeding to reduce the wild hosts which encourage the bugs, and by prompt picking of seed cotton before the bugs have time to attack it.

COFFEE

684. The Coffee Berry Borer, *Hypothenemus (Stephanoderes) Hampei* Ferr. did much damage to the Masaka robusta crop. Until facilities can be found for testing out the insecticidal control methods reported to be successful in the Congo and Brazil, only clean picking can be confidently advised to control the pest in Uganda.

685. Dusting against *Antestiopsis (Antestia)* spp. and *Habrochila ghesquieri* Schout (Coffee Lace Bug) is becoming routine on Mount Elgon. It has now been started also in the Western Province against *Antestiopsis*. The policy is to use small simple cheap hand machines, because then the peasant can do his own work. Since both bugs are sedentary, the man who cleans his own plot reaps the benefit, while his lazy neighbour can suffer. Dust is preferred to spray, being easier to apply. Pyrethrum is used rather than D.D.T. or any other persistent insecticide, so as not to encourage other pests by killing their natural enemies. This is particularly important with coffee, which supports many insects, at present doing little harm, but capable of doing much if allowed to multiply. At the present high values the coffee crop can stand the high cost of the pyrethrum dust, but a cheaper dust would be better. It is difficult to get good supplies of a suitable duster, the excellent little shell powder duster being no longer made, and the Waldron Powder Distributor being much more expensive.

686. Help was given to the botanical section and the Bugisu Coffee Board in an empirical, large-scale field trial of spraying with "perenox" to reduce rust (*Hemileia*) and leaf fall on the lower altitude arabica of Mount Elgon. With the tall, thin trees found there, it was found that extension lances were needed. The operator required one hand free, and pressure-retaining knapsack sprayers were therefore preferred. A good spray cover was postulated, so the trees were sprayed to run-off. In order not to use too much water, fine nozzles were used, but even so the carrying of water was a problem. If spraying is to become practical, a means of reducing the volume of water must be found. We now know the practical difficulties in organising spraying, but the problem will not be solved until more scientific work is done on the fungi concerned, their control, and the physiological causes of yellowing and leaf fall. Soil conditions are certainly deeply involved in the problem.

INSECTS IN GRASS HEADS

687. We have long known that thrips are common in young heads of *Cynodon*, *Chloris* and other grasses and have suspected that they may be one of the causes of partly empty heads of grasses and cereals, while Gall Midges have been bred commonly from various grass heads at Kawanda. The new Entomologist paid some attention to this problem at Serere, where the Pasture Research Officer found that many grasses produced little seed with poor germination. Insect damage was not found in *Setaria sphacelata* or *Melinis minutiflora*. *Cenchrus ciliaris* only produced two specimens of a Gall Midge (*Contarinia sorghicola*). *Panicum maximum* had in September 1% and in December 5% of its seeds with Gall Midge larvae, and *Contarinia sorghicola* Coq. was bred out. *Brachiaria brizantha* had 60% of the seeds infested by larvae of an unidentified Gall Midge. It also had dying and whitening of individual florets. Small numbers of unidentified thrips were seen feeding on ovaries and breeding in flower heads of *Hypparrhenia rufa*.

688. On *Chloris gayana* almost every young flower head was infested with thrips, which were seen feeding on very young ovaries. The thrips entered the head as soon as the leaf sheath started to open, and only remained until the head was wide open. A simple plot trial of insecticide (10% D.D.T. dust at 35 lb. per acre per treatment) *versus* fertiliser (sulphate of ammonia and double superphosphate) gave interesting suggestions. The D.D.T. greatly reduced the thrips but had to be applied at intervals of a few days to be effective, since fresh, uncontaminated flower heads were appearing and becoming attractive daily. The fertilised plots had fewer thrips than the unfertilised, apparently because the flower heads opened more quickly and were attractive for a shorter time. On the untreated plot only 8% of the seeds set, while the fertiliser gave between 30% and 40% set, and fertiliser *plus* insecticide over 50%. Germination tests suggested some improvement from the use of D.D.T. and possibly some from fertiliser. It appears that fertilising is the better method of improving seed supply. An insecticide might be more effective in large fields than in the small plots tested, owing to the mobility of the thrips.

CEREALS

689. Cereal pests, particularly stem-borers, were a major project of the section and the main concern of the Entomologist at Serere. He reports as follows:—

690. "Extensive survey work has been carried out in Teso and to a lesser extent Northern Province. There are now known to be five major Lepidopterous stalk-borers of economic importance: *Busscola fusca* Fuller, *Chilo zonellus* Swinhoe, *Sesamia calamistis* Hampson, *S. poephaga* Tams and Bowden and *S.? botanephaga* Tams and Bowden. The dry-season survival of these has been studied, their range of host plants—both wild and cultivated—surveyed, host-plant preference and distribution. *Chilo* is undoubtedly the most widespread and harmful in the short-grass zone

and present evidence indicates that sorghum is the only crop attacked heavily enough to need insecticidal treatment. A preliminary "look-see" dusting trial was laid down, and the best treatment yielded 1,000 lb. of unthreshed grain more than the controls, even though only a 60% control was achieved.

691. Several species of shoot flies have been bred out and it is hoped to study these more fully this coming year. Seed head pests have also been studied, particularly the sorghum midge, *Contarinia sorghicola* Coq."

692. Concerning birds he reports as follows: "Some time was devoted to studying the migrations of birds concerned with damaging cereals in the field. Bulrush-millet is very heavily attacked and as a result cannot be grown in the first rains while the local migrants are present. Sorghum is also attacked fairly heavily and to a lesser extent maize cobs and finger millet. Almost total destruction of all *Panicum maximum* and *Setaria sphacelata* seed is also caused by these birds.

693. The main ones concerned are the resident species, *Ploceus cucullatus bohndorffi*, *Spermestes cucullata cucullata*, *Streptopelia* spp. and *Stigmatopelia senegalensis*. The migratory species which are responsible for most of the damage and are common throughout these areas are *Quela cardinalis cardinalis*, *Euplectes orix franciscana*, *E. hordeacea hordeacea* and *Coliuspasser macrourus macrourus*. Fortunately these birds are only present during the first rains from about June to September. Crops and grasses coming into head after this are not so severely damaged by the resident species."

STORED PRODUCTS

694. Attempts to reduce losses of stored agriculture produce by pests have been a major project of the section. At this stage efforts have been directed chiefly to persuading the official and unofficial public that losses are serious, that they can be largely avoided by applying what is already known, and that they are due to bad handling and storing.

695. A paper has been published in the East African Agricultural Journal explaining the problem.

696. In collaboration with the Kampala produce exchange numerous samples of produce were examined, and standards were set for most of the main products of the country. These have been accepted by the other produce exchanges of East Africa, a tribute to their value. Unfortunately the trade is unwilling yet to go beyond a single standard, the "Fair Average Quality", for each product, anything below it being "Under Grade". However, we aim eventually to achieve a series of five or so grades for each commodity with big differences in price. The first object is to give a price incentive to the growers and merchants to grow, prepare, buy, transport, store and process their produce in the best possible way. The second is to raise the present mediocre quality of our exports, so that they

will hold their places in the world markets as competition increases and if prices fall. Protection from pests is an important part of the campaign of improvement.

697. Another line of attack, aimed at improving produce consumed in the country, is legislation to enforce minimum standards for food. This is being sponsored by the Medical Department, but we are interested in it.

698. Pests cannot be kept out of premises which are not kept clean, and stores and mills cannot be kept clean unless they are designed specially for cleanliness and pest control. This question has been studied in an informal inter-departmental committee, formed at the instigation of this section. Draft specifications for three grades of produce stores and for mills have been drawn up. It remains to make them legal. Since practically all produce premises in the country are faulty in design and construction, it will clearly only be possible to improve storage gradually. It is hoped to compel all new buildings put up in controlled areas to conform with the specification, and to insist on old ones being modified or replaced after a certain number of years.

699. The same committee has made headway with draft rules for handling and storing produce. It is hoped to enforce some by law, while others will have to be adopted through persuasion.

700. Enquiries have been made about new methods of storing grain and other produce in the damp tropics, a subject about which little is known. Trials of many different methods under realistic practical conditions, yet with careful scientific control, are needed. Any attempt to launch out into large storage schemes before doing these trials is likely to cause much waste and expense.

701. In this connection two trials of the Argentine method of sealed pit storage, as perfected in Tanganyika, were tried. A small trial pit had been made at Lira and filled with finger millet. It was examined and sampled at opening, and the grain was found to be perfect after 14 months storage. Only a small quantity under a little leak at the edge of the roof was spoilt. The moisture content averaged just over 13% (oven at approximately 105° C. for 24 hours). No insects were present. The Tanganyika Government kindly did a test of damp Uganda maize (13.5–20% M.C.) in their experimental pit at Moshi under close supervision. After five months they found that the grain was deteriorating, and the pit was opened. Representative samples sent to Kawanda agreed with the Tanganyika findings, that insects were absent but that the grain was discoloured and had a fermenting smell. Samples aired after some weeks lost most of the smell and colour and were more or less edible. Very few of the tested grains germinated.

EDUCATION AND PROPAGANDA

702. A course in agricultural entomology has been given by the Senior Entomologist to the ten second year agricultural students at

Makerere College. In future the College itself hopes to provide this course, which has been given by the entomological section for many years. The Entomologist at Serere lectured to chiefs' and instructors' courses, as well as to departmental staff. The Insecticide Research Mechanic and Assistant Agricultural Officer organised an exhibit for the first Agricultural and Trade Show in Kampala.

SPECIALIST COMMITTEE

703. The Entomologist, Serere, represented the section at the meeting of the inter-territorial Specialist Entomological and Insecticides Committee at Nairobi. The programmes of the East African Agricultural, Forestry and Insecticidal Entomologists were reviewed and correlated.

PLANT QUARANTINE

704. The entomological section continued to act as plant inspectors, and to operate the Plant Import Regulations in collaboration with the botanical section, the customs and the Kenya authorities. The pest problems arising in this work are less difficult than those concerning diseases. It is becoming yearly clearer that an experienced Plant Pathologist must be available for consultation. The traffic is not yet adequate to justify a special plant inspector staff, which would enable imports to be better controlled. During the year 11 plant import permits were issued for Kenya, 31 for other countries, and 38 phytosanitary certificates were issued for plants or seed for exports.

PUBLICATIONS

705. MICHELMORE, A. P. G. Food storage problems in Uganda in relation to insect pests: *E. African Journal* XXI, 2, 65-68, 1955.

TROUGHT, T. E. T. Preliminary Tobacco Eelworm Investigations in Uganda: *East African Journal* XXI, 1, 28-31, 1955.

ACKNOWLEDGMENTS

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